Project Inshore

Stage 3 - Strategic Sustainability Review

Cornwall Inshore Fisheries & Conservation Authority

SEAFISH
the authority on seafood

Shellfish Association of Great Britain

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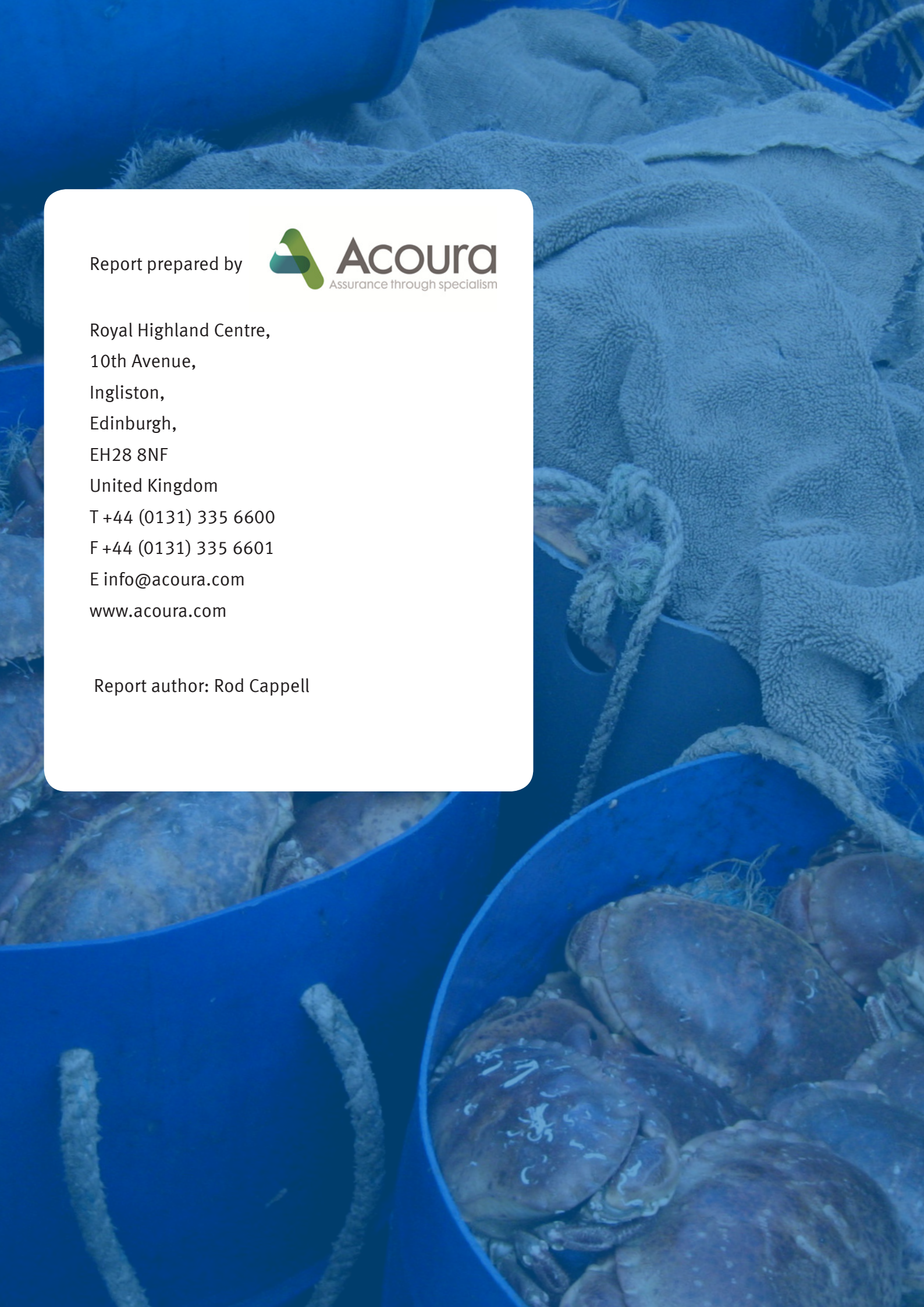

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Photographs:

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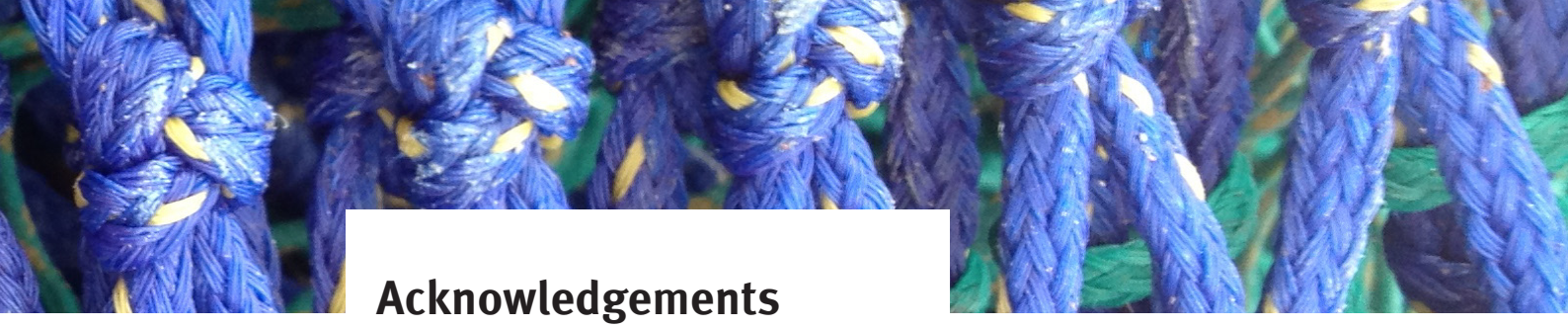
Stock Assessment and HCR development, see stand-alone document



Acknowledgements

Project Inshore was delivered with funding and guidance from the following partners:

Direct Seafoods

M&S EST. 1884

seafood choices ALLIANCE produits de la mer

SEAFISH the authority on seafood

Sainsbury's

Shellfish Association of Great Britain

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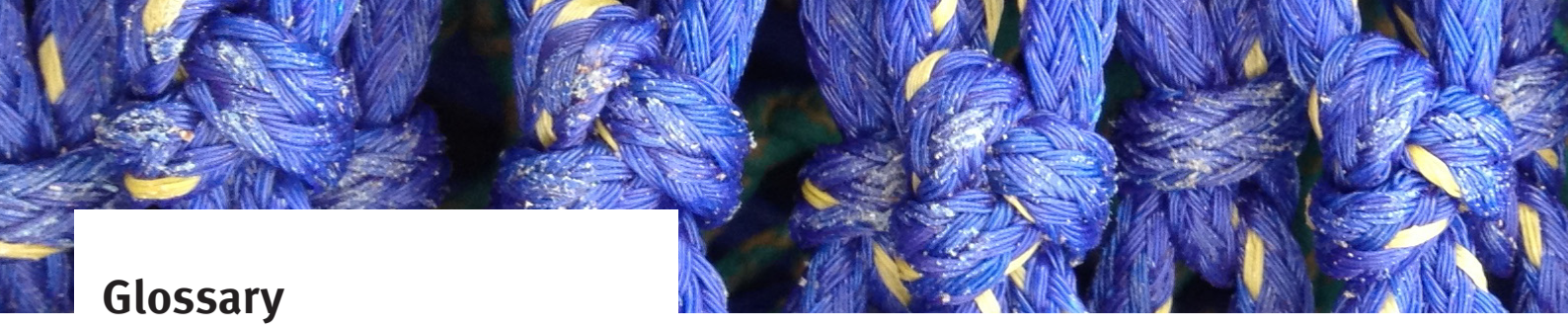
North Eastern IFCA
Northumberland IFCA
North Western IFCA
Southern IFCA
Sussex IFCA

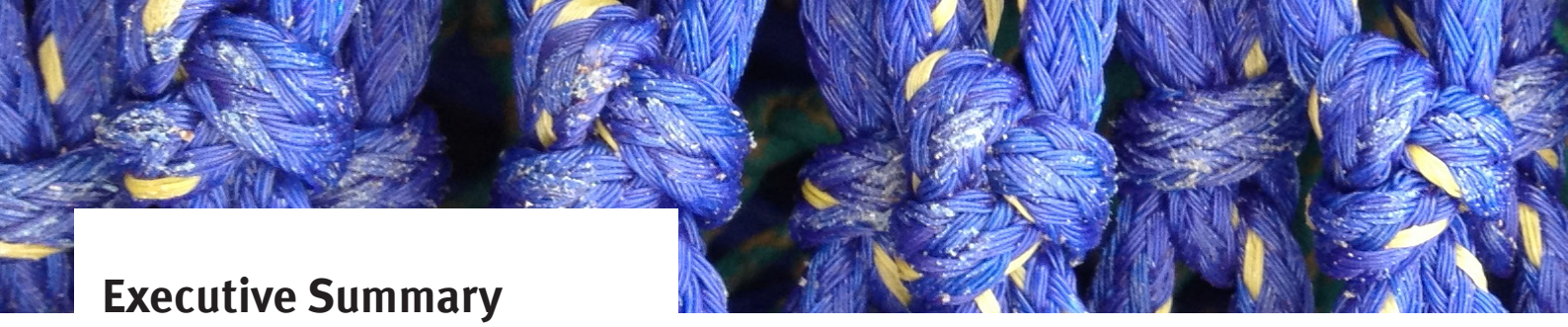
And input from the Project Inshore Advisory Group comprising:
Seafish; Marine Stewardship Council (MSC); Shellfish Association of Great Britain (SAGB); Association of IFCAs; Department for Environment Food & Rural Affairs (DEFRA); Direct Seafoods; M&S; National Federation of Fishermen's Organisations (NFFO); Natural England; New Under Ten Fishermen's Association (NUTFA); WWF



Glossary

ACOM	Advisory Committee (ICES)
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
CAB	Conformity Assessment Body
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CFCA	Community Fisheries Control Agency
CFP	Common Fisheries Policy
CIFCA	Cornwall Inshore Fisheries and Conservation Authority
CITES	Convention on Trade in Endangered Species of Wild Flora and Fauna
COM	Common Organisation of the Markets
DEFRA	Department for Environment, Food and Rural Affairs
EC	European Commission
EEZ	Exclusive Economic Zone
EFF	European Fisheries Fund
EMS	European Marine Site
ETP	Endangered, Threatened and Protected Species
EU	European Union
FCI	Food Certification International
FIP	Fishery Improvement Plan
HCR	Harvest Control Rule
ICES	International Council for the Exploration of the Sea
IFCA	Inshore Fisheries and Conservation Authorities
IUCN	International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated
JNCC	Joint Nature Conservation Committee
OSPAR	Oslo and Paris Conventions
MCAA	Marine and Coastal Access Act
MCS	Monitoring, Control & Surveillance
MCZ	Marine Conservation Zone
MMO	Marine Management Organisation
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MSC	Marine Stewardship Council
NEAFC	North East Atlantic Fisheries Commission
NFFO	National Federation of Fishermen's Organisations
NGO	Non-governmental Organisation
NUTFA	New Under Ten's Fishermen's Association
Nm	Nautical mile
PI	Performance Indicator
PO	Producer Organisation

PSA	Productivity Susceptibility Analysis
RAC	Regional Advisory Council
RBF	Risk based Framework
SAC	Special Areas of Conservation
SAGB	Shellfish Association of Great Britain
SG	Scoring Guidepost
SI	Scoring Issue
SICA	Scale Intensity Consequence Analysis
SPA	Special Protection Areas
STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch
UoC	Unit of Certification
VMS	Vessel Monitoring System
WGNEW	Working Group on New MoU Species



Executive Summary

1. Project Inshore is an ambitious initiative led by Seafish, Marine Stewardship Council (MSC) and Shellfish Association of Great Britain (SAGB) launched in June 2012. It seeks to work towards an environmentally sustainable future for English inshore fisheries.

2. The MSC standard for sustainable fisheries provides a useful indicator of where a fishery is in relation to the FAO Code of Conduct for Responsible Fisheries. It also provides a structure to guide the development of future management action, which should lead to a fishery that is well managed. However, it is the choice of operators within a fishery whether to seek certification against the MSC standard through an assessment.

3. This report presents stage 3 of Project Inshore where findings of stage 1's data gathering on fisheries within each IFCA and the results of stage 2's MSC pre-assessment conducted for fisheries around England's coast (involving over 400 different species, stock and gear combinations) are considered to provide a Strategic Sustainability Review tailored to the Cornwall IFCA.

4. The stage 2 pre-assessment found that some stocks fished in the English Inshore are already 'well managed' and fished sustainably, indicating that they could proceed with full MSC assessment (at least when fished by certain gears).

5. For these fisheries the report outlines the steps needed in preparation for full assessment and the benefits of increasing the size of the client group (typically up to the spatial range of the stock) for any full assessment.

6. Most of the stocks recommended for full MSC assessment are managed under EU quotas, with regular and routine scientific advice (as provided by ICES) and ideally managed under a Long Term Management Plan.

7. Other fisheries considered to be at or close to the MSC standard are spatially restricted inshore bivalve fisheries where management responsibility is clearly devolved to a local grantee, such as an IFCA, or managed under a Regulating Order (e.g. cockle or mussel fisheries).

8. A fishery fitting this latter category is the Fal Oyster Fishery and it is suggested that operators within this fishery be informed that full assessment may be possible when the new Regulating Order is in place.

9. All the other stocks considered are identified as having "gaps" meaning that they are not currently recommended to proceed to full MSC assessment, until these gaps can be adequately addressed. Typically this would also mean that they do not meet, or cannot be demonstrated to meet "Good Environmental Status" targets.

10. Project Inshore has worked with IFCAs in order to identify those fisheries in their region that are locally important and those fisheries where IFCA-led management may be appropriate. For Cornwall IFCA the priority species identified are crab, lobster, sea bass, scallop and spider crab.

11. The stocks that IFCAs are best placed to lead on management are typically shellfish, although not all shellfish (some are already subject to national or EU level management such as scallops and Nephrops). Of the priority species, crab, lobster and spider crab are more suited to IFCA-led management, while sea bass and scallop management should be developed at a national level. Suggested actions responding to the pre-assessment findings for species suited to IFCA-led management (crab, lobster, spider crab) is provided in section 7 of this report.

12. IFCAs are facing increasing demands on their time and resources with the management of European Marine Sites (EMS). IFCA-led fisheries management is therefore only likely to occur for priority species.

13. All of these fisheries require fisheries specific management, with sufficient understanding of stock status to enable adaptive stock management defined by management rules. From an MSC point of view this bridges the requirements of both P1 (the stock) and P3 (the management).

14. This report provides IFCAs with guidance in the development of adaptive stock management for those stocks or species that the IFCAs maybe best placed to lead on stock management.

15. For crab and lobster, CEFAS has recently defined stocks and provided stock assessment and it is appropriate to manage as joint management units with other IFCAs. Crab and lobster already have defined stock assessment units pointing to regional management involving the relevant SW England IFCAs.

16. For spider crab stock management units need to be defined (including extent of migration and spawning/settlement behaviour) as an initial step in a stock specific fishery management plan.

17. A key issue is the time required to develop and agree a fishery management plan. This may not be realistic for IFCAs given their current and projected workload. Therefore an alternative approach to the development the necessary fisheries management is under a Fishery Improvement Plan (FIP) that can be funded and driven by other parties. IFCAs would be essential stakeholders and advisors in what can be an industry-driven FIP process. The IFCA would be asked to enforce the resulting plan, which may require the adaptation of existing bylaws or adoption of new bylaws, but the often-lengthy development and consultative process would not be by the IFCA.

18. There remain a significant number of species / stocks which are not obviously being managed at an EU / multinational level, and which are not suited to local (inshore) adaptive stock management. It must be identified where management responsibility should lie for these stocks and for management to be planned to also ensure 'Good Environmental Status'. The IFCAs are still expected to play an important role as key stakeholder and a partner in management.

19. Stage 4 of Project Inshore will continue until 2015. During this stage 4 the focus of the MSC English Fisheries Outreach team will be on providing support for those fisheries wishing to move into full MSC assessment, but may also facilitate the development of FIPs.

1. Introduction

1.1. Project Inshore background

Project Inshore is an ambitious initiative led by Seafish, Marine Stewardship Council (MSC) and Shellfish Association of Great Britain (SAGB) launched in June 2012. Project Inshore is about working towards an environmentally sustainable future for English inshore fisheries. The UK Fisheries Minister, Richard Benyon noted at the time that Project Inshore "…should help to ensure that our inshore fleet can continue to flourish, that fish stocks are managed sustainably and our marine environment is given the protection it needs". This project has carried out MSC pre-assessments for an extensive range of fisheries around the English coast and used the results of these pre-assessments to form the basis for Strategic Sustainability Reviews for English Inshore fisheries to provide a road map to guide future management decisions.

The funding for the project comes from a diverse range of sources notably the European Fisheries Fund (EFF), the Sustainable Fisheries Fund and industry (Seafish, UK retailers and processors). Other partners in the project include the Marine Stewardship Council, Shellfish Association of Great Britain and Seaweb's Seafood Choices.

The Sussex Inshore Fisheries and Conservation Authority (IFCA) (previously the Sussex Sea Fisheries Committee) piloted a multi species fishery methodology in 2010 with its 'Navigating the Future' Inshore Fisheries Sustainability Pilot (Dapling et al., 2010). 'Navigating the Future' utilised the MSC pre-assessment criteria to evaluate the performance of 26 local inshore fisheries. Project Inshore carries this model forward on a nationwide scale for key commercial fisheries operating within the remaining IFCA districts.

Food Certification International Ltd (FCI) undertook stages 1 & 2 of Project Inshore, with concluded with MSC pre-assessment findings. For the advisory work required for Stage 3 of Project Inshore, Acoura Ltd has assembled a team comprised of many of the team members from stages 1 & 2. The Stage 3 project team comprises of independent experts from Marine Institute (Ireland), PAH Medley, Nautilus Consultants, Poseidon Aquatic Resource Management Ltd and TD Southall.

1.2. Project Inshore Stages

English inshore fisheries to strategic targeted action as follows:

- Stage 1: Macro analysis and profiling of English inshore fisheries including:
    - · Data collection/ information gathering phase.
    - · Broad scale analysis of English fisheries.
    - · Development of list of fisheries (species/gear combination) to progress to:
- Stage 2: Pre-assessment of English fisheries based on an aggregated/matrix approach for assessing each selected fishery (species / gear combination) in relation to the Marine Stewardship Council (MSC) standard. The key output of Stage 2 will provide a preliminary determination of how closely each performance indicator of each fishery meets the MSC standard.
- Stage 3: Development of bespoke Strategic Sustainability Reviews for each English Inshore Fisheries and Conservation Authority (IFCA) to facilitate English inshore fisheries moving towards a level judged sustainable by the MSC standard.

The output of stage 1 was delivered in October 2012. The output of Stage 2 was delivered in June 2013. Both Stage 1 & 2 outputs are now publically available on-line from the Seafish website.

1.3. Report Aims & Objectives

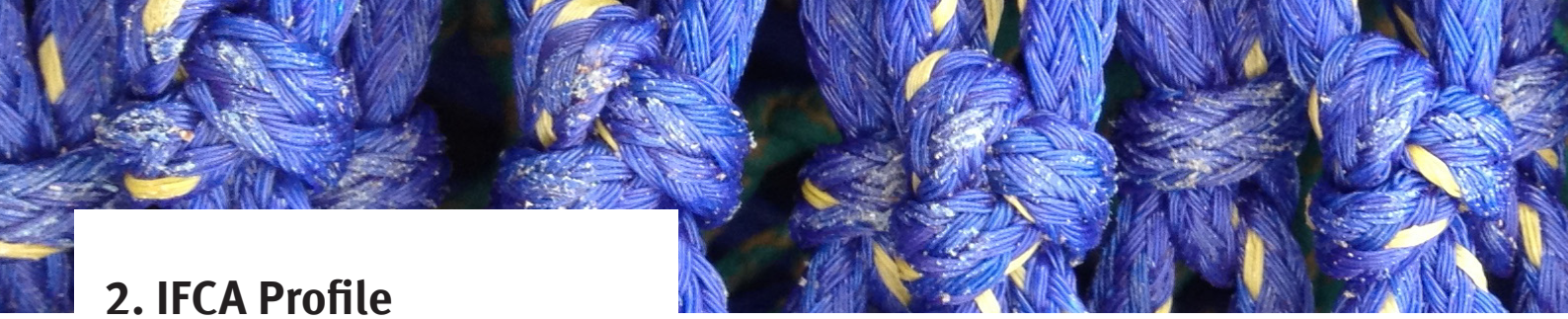
This report forms an output of Stage III of Project Inshore and provides a Strategic Sustainability Review for the Cornwall IFCA. The reporting outputs of stage I and stage II of Project Inshore provided national overview documents for English Inshore Fisheries. By contrast, this report is tailored to the requirements of a single IFCA (Cornwall). A further eight such reports[1] are being produced for other English IFCAs as part of this third stage of Project Inshore.

This report seeks to:

- Describe the key characteristics of the IFCA district and the fisheries within the district.
- Provide a review of the findings of the MSC pre-assessment process for fisheries in the region that was carried out in stage II of Project Inshore.
- Highlight the process and next steps required for those fisheries identified as ready for full MSC assessment
- Provide a strategic structure to guide future management actions for those fisheries where the IFCA is responsible for stock management to show how they can move towards a level deemed sustainable by the MSC standard.
- Highlight those fisheries where stock management initiatives need to be taken at a greater scale of management jurisdiction.

This report is advisory and is intended to provide a blueprint for developing local stock management initiatives and action where this is deemed appropriate to do so.

[1] Similar work was undertaken for the Sussex district as part of the 'Navigating the Future' project and is therefore not covered by Project Inshore.



2. IFCA Profile

2.1. Governance structures

The Marine and Coastal Act (MCAA) 2009 establishes and sets out the responsibilities and powers for the Inshore for the Inshore Fisheries and Conservation Authorities. In terms of Governance the Secretary of State retains oversight of all IFCA operations, including byelaw development, but is charged with providing guidance on best practice that the IFCAs should follow.

The Cornwall IFCA (CIFCA) was established under the 'Cornwall Inshore Fisheries and Conservation Order 2010'. The IFCA took on its full statutory role from the 1st April 2011.

The limits of the District extend from Marsland Mouth on the north coast of Cornwall, around to the western end of the Plymouth Breakwater in Plymouth Sound on the south coast. This includes the estuaries and all waters out to six nautical miles.

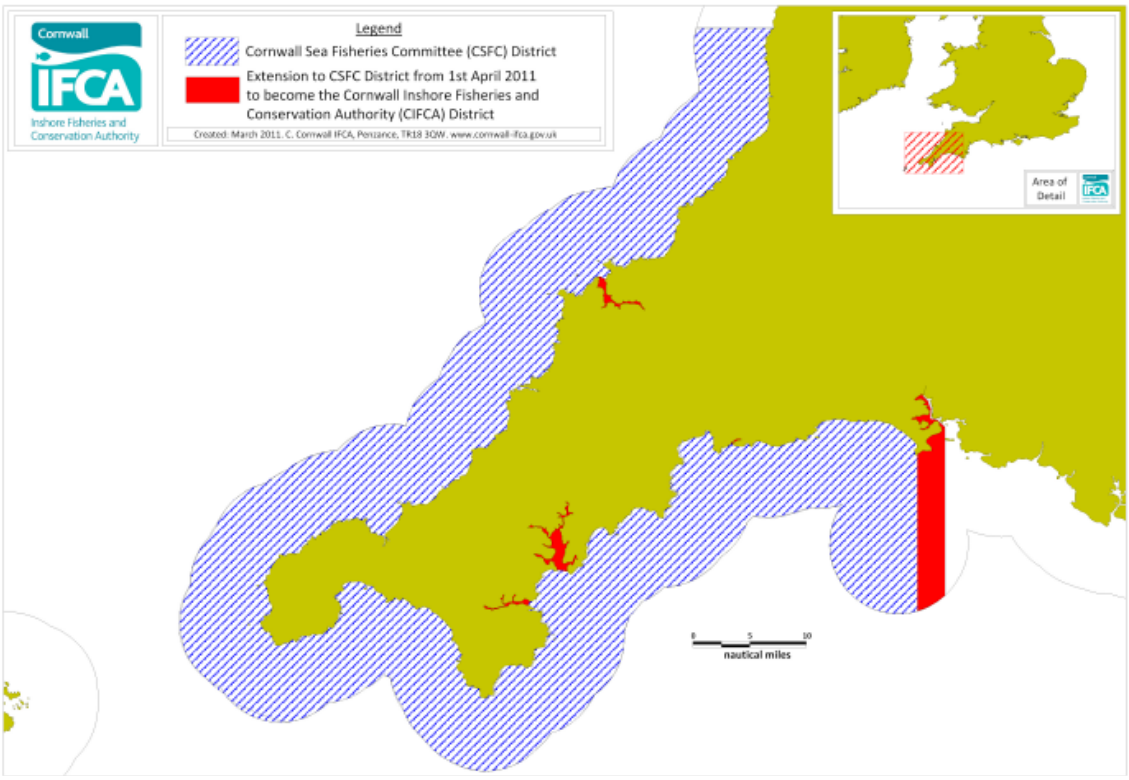


Figure 1:

Cornwall IFCA boundaries

2.1.1.The IFCA Committee

The CIFCA is a stand alone Committee within Cornwall Council and consists of 21 members;

- 7 'Council Members' who must be members of and appointed by Cornwall Council
- 12 'General Members' who must be appointed by the Marine Management Organisation (MMO) and must include at least one employee of the MMO. The MMO appoints stakeholder representatives including commercial fishers (various sectors), recreational fishers.
- 2 'Additional Members' 1 must be from Natural England and 1 must be from the Environment Agency.

The committee members' role is to decide and comment on strategy and direction and decide on budgets and staffing levels etc. Interestingly, in the context of Project Inshore, the IFCA annual plan also notes that it is the role of the committee members to decide on "stock management measures".

2.1.2. IFCA Staff

In terms of governance, it is the officers and administration staff, lead by the Chief IFC Officer,

which implement the strategic decisions of the Authority (i.e. members) and report back to the committee on a quarterly basis on progress against those strategic goals.

CIFCA employs 16 staff: 1 Chief Officer, 2 administrative officers, 1 policy officer, 3 patrol boat crew, 6 enforcement officers, 3 research officers. The areas of staff responsibility are set out in the Annual Plan, encompassing all aspects from enforcement, science and conservation to administration and PR. Additionally, the IFCA strategically seeks to ensure that staff members are able to perform secondary duties. Examples of the types of duties that may be added to a staff members remit alongside their primary role are enforcement, habitat mapping, data compilation and entry (GIS), communications and other research. In this way the capacity of the IFCA staff group is enhanced.

2.2. Strategic Objectives

Management of English 'inshore' fisheries is a shared responsibility of the MMO and IFCAs. Both have a duty to deliver all EU fisheries regulations under the CFP with the opportunity to apply more restrictive measures. A memorandum of understanding (MOU) exists between the two organisations to better ensure a co-ordinated approach to management. Inshore Fisheries and Conservation Authorities replaced the existing Sea Fisheries Committees from April 2011. As well as managing inshore fisheries, they took on new conservation duties as set out in the Marine and Coastal Act (MCAA) 2009. The national vision for IFCAs, which forms the key strategic objective which all IFCAs share is:

> "To lead, champion and manage a sustainable marine environment and inshore fisheries, by successfully securing the right balance between social, environmental and economic benefits to ensure healthy seas, sustainable fisheries and a viable industry".

Below this overarching vision there are seven nationally agreed success criteria (with associated high-level objectives, outcomes and performance indicators), which have been agreed and are again applicable to all IFCAs:

1. IFCAs have sound governance and staff are motivated and respected
2. Evidence based, appropriate and timely byelaws are used to manage the sustainable exploitation of sea fisheries resources within the District
3. A fair, effective and proportionate enforcement regime is in place
4. IFCAs work in partnership and are engaged with their stakeholders
5. IFCAs make the best use of evidence to deliver their objectives
6. IFCAs support and promote the sustainable management of the marine environment
7. IFCAs are recognised and heard

The above criteria are set within a timeframe up to 2015. In addition, Article 153 of the MCAA (2009) sets out the duties for all IFCAs. These are restated in the annual plan:

a) Seek to ensure that the exploitation of sea fisheries resources is carried out in a sustainable way,

b) Seek to balance the social and economic benefits of exploiting the sea fisheries resources of the district with the need to protect the marine environment from, or promote its recovery from, the effects of such exploitation,

c) Take any other steps which in the authority's opinion are necessary or expedient for the purpose of making a contribution to the achievement of sustainable development, and;

d) Seek to balance the different needs of persons engaged in the exploitation of sea fisheries resources in the district.

The Cornwall IFCA annual plan sets out work priorities under each of the seven success criteria outlined above.

2.3. Capacities & funding

The CIFCA have 16 full time staff based at the Penzance offices or on the main patrol vessel, Saint Piran. This 27m patrol vessel is moored in Newlyn and is the largest of the four seagoing vessels operated by Cornwall IFCA. It also operates two RIBs, Lyonesse and Avalon, and a 10.5m fibreglass catamaran, Tiger Lily, based at Penryn that is used for research.

Details of the CIFCA budget and are set out in the annual report and show an overall operating budget of just over £1million for 2013/14.

2.4. Existing activities, obligations & commitments

In the context of Project Inshore Stage 3, which looks at strategic future direction for IFCA fisheries management actions, it is important to consider the existing commitments that currently shape much of the IFCAs working priorities and which are over and above the routine operation of enforcement, control, research and monitoring that is the core business of any fisheries management authority. The 2013/14 annual plan identifies that the following areas of work will dominate:

1. Marine Protected Areas (MPA) management (EMS and MCZs);
2. Byelaw review; and
3. Enforcement activities.

Marine Protected Areas

Following a Ministerial review, all IFCAs have been tasked to make use of the powers invested by the Marine and Coastal Access Act 2009 to make byelaws that protect sensitive designated features in European Marine Sites (EMS) (specifically in SACs and SPAs which form part of the Natura 2000 network) from activities that could impact these features as identified by the European Marine Sites Implementation Group. This requires the introduction of legislation to protect "High Risk" features by 2013 (Cornwall IFCA ratified its byelaw in October 2013 and is awaiting approval by the Secretary of State), followed by consideration of the need to protect "medium and low risk" sites by 2016. In all cases this will need to be supported by consultation and impact assessment work.

In the district there are a number of existing SACs and SPAs with marine features. There are also candidate SACs and potential SPAs, which must be afforded the same level of protection (Figure 2).

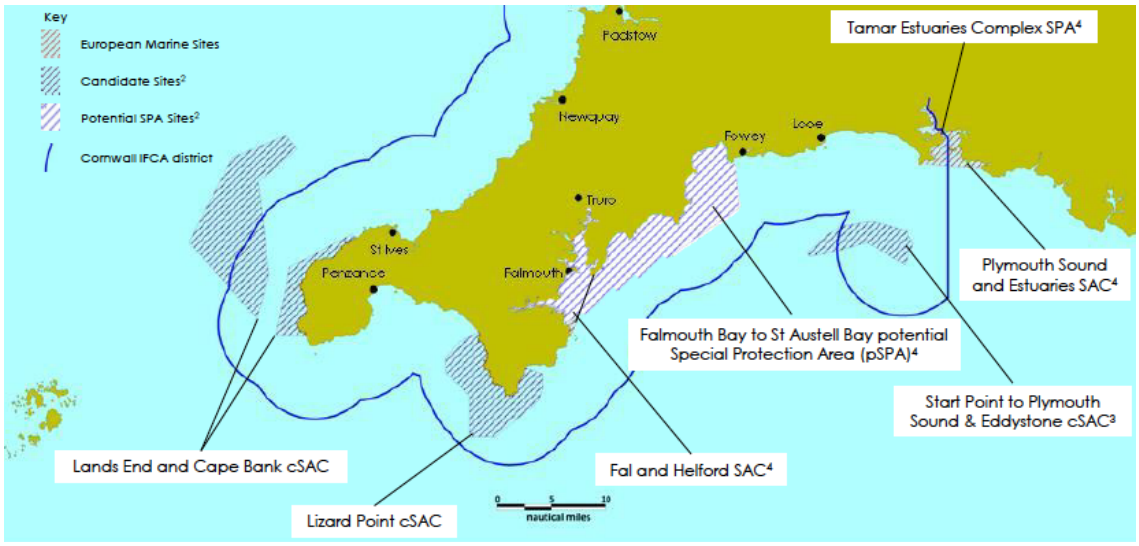


Figure 2:

European Marine Sites in the Cornwall IFCA district

Source: Cornwall-IFCA.gov.uk

2 Candidate and potential sites must be considered the same as designated sites and given the same level of protection.

3 Part of SAC which also covers a separate section in Devon and Severn IFCA's District.

4 Overlapping protected areas

In addition to the EMS referred to above, 14 of the 27 proposed MCZs announced by DEFRA are in or adjacent to the Cornwall District. Under MCAA 09 IFCAs have a duty to further the conservation

objectives of MCZs and will be expected to introduce byelaws regulating fishing activity where necessary.

2.5. District Fisheries profile

2.5.1. Key species

Stage 1 of Project Inshore presents a national overview of key fisheries statistics. This includes a section profiling the key fisheries of the Cornwall district. A section of the report (1.2.1 - Data Uncertainties and Information Constraints) points out there are a number of problems when seeking to interpret national data to obtain an accurate picture of inshore landings, within the IFCA boundary. This discusses the challenge of defining what is 'inshore' and the limitations in landings data for the inshore fleet in particular. The best initial estimate of inshore landings is then taken from the MMO national landings database of all landings caught within the overlapping ICES statistical rectangles – a much larger area than the IFCA area.

Even within this area there are problems with the data estimates, with some landings not being represented. Notably in the context of Cornwall, the recording of oyster landings from private fisheries may not be fully captured.

Many under 10m vessels which are not required to fill in log books do submit monthly shellfish returns, but this data is not fully integrated into the national database. Instead it is the information from Registration of Buyers and Sellers (sales note returns) that is thought to form the main tool for estimating inshore landings, but not all landings may be recorded as there are minimum reporting levels (25kg for 'private consumption').

Part of the consideration for this Stage 3 of Project Inshore will be to consider how best to obtain the required information for inshore stock management. An accurate understanding of catches is an essential pillar of this along with effort and other time series data (see later in this report).

Figure 3:

Landings from ICES rectangles covering the Cornwall IFCA district.

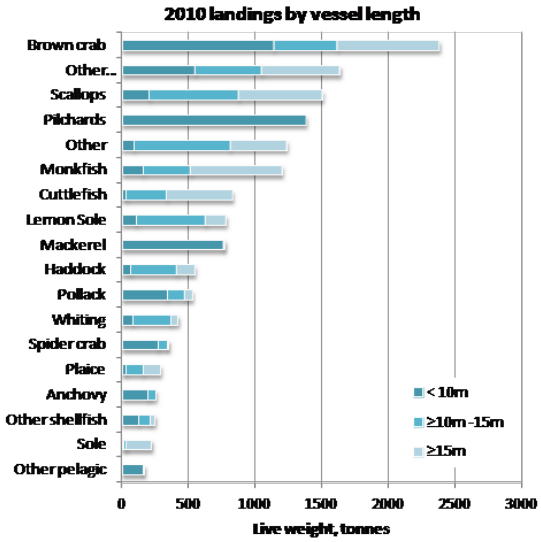


Figure 3 presents recent landings figures for the ICES rectangles that include the IFCA district. This includes landings by larger vessels that may or may not be fishing in the IFCA district (trawlers above 18m are not permitted in the 0-6 mile zone). From a Cornwall IFCA perspective, important landings are brown crab, scallops, and spider crab. Lobster (likely to be included in the 'other' grouping) is also a significant inshore fishery. Pilchard and mackerel are significant seasonal inshore fisheries (and have already achieved MSC certification).

2.5.2. Fleet Characteristics

The data constraints highlighted above also apply when seeking to draw an empirical interpretation of the fleet operating in the Cornwall district. In particular it is likely that the statistics are distorted by the operation of larger vessels operating beyond the IFCA boundary, but which are none the less present in the statistics of vessel catches in the overlapping ICES rectangles.

An IFCA byelaw restrict fishing with trawl within the district to vessels below 18.28 metres overall length or 221 kW engine power.

The fleet within the Cornwall IFCA district is made up of mainly under 10m boats, fishing single day

trips largely within the IFCA district – although there is no restriction on fishing beyond the IFCA district and many do.

A range of static and mobile gears is used in Cornwall. A significant number of inshore vessels use pots to target crab, lobster and spider crab. Finally towed dredges are used to target scallops and oysters. Some vessels are also involved in seasonal net fisheries for pilchard.

2.6. District Ecosystem Profile

2.6.1. Ecosystem Overview

2.6.2. Local Designations

There are a large number of nature conservation designations in the Cornwall district. Most of these are SACs protecting areas of rocky coast and reef or estuaries. A large number of additional sites are proposed as MCZs.

Table 1:

Description of European Marine Site features in Cornwall District

Name	Designation	Features
Fal and Helford	SAC	Marine areas. Sea inlets (60%) Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins) (35%) Salt marshes. Salt pastures. Salt steppes (3%) Coastal sand dunes. Sand beaches. Machair (1%) Shingle. Sea cliffs. Islets (1%)
Lands End and Cape Bank	SAC	The Lands End and Cape Bank SAC consists of a complex and biodiverse group of upstanding rocky reef pinnacles with areas of sand which stretch out from the major bays and as patches between rock outcrops. Much of the coastal margin deepens to 30m within a kilometre or two of the shore. The resistant headlands and islands are formed of a variety of rock types including granite, metamorphic and volcanic rocks which also form a fringing reef system. The site's southwesterly position on the British coast means that it is exposed to the full force of the waves and oceanic swells coming in from the Atlantic. The reef complex is also free from any major source of fresh water run off from the land.
Lizard Point	SAC	Lizard Point is unique in terms of its underlying geology, with no other existing SAC in the surrounding area offering such a variety of bedrock. The Lizard Point site consists of rugged inshore and offshore areas of submerged bedrock and boulders of complex geological origin, separated by extensive areas of thin, coarse mobile sediment covering flat sedimentary bedrock to the south and east, and the flat metamorphic bedrock to the west. There are two areas of upstanding offshore reef extending from approximately 3.5 to 9km offshore and extending down to depths of 80m in some areas.
Start Point to Plymouth Sound and Eddystone	SAC	Numerous areas of reef (in many forms) exist within the Prawle Point to East Rutts and Bigbury Bay to Plymouth Sound reefs. The site includes large areas of outcropping bedrock, boulders and cobbles in the offshore extents of the area. The reefs between Prawle Point and Salcombe also contain a variety of complex structures and habitats and is characterised by boulders and rocky gullies, fissures. The inshore reefs here support large kelp forests and a variety of other algal species. Kelp Forests are important nursery grounds for a variety of species and provide rich and diverse habitats. More importantly, they also form the base level for a rich food chain as they directly convert energy from the sun.

Plymouth Sound and Estuary	SAC	Marine areas. Sea inlets (50%) Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins) (40%) Salt marshes. Salt pastures. Salt steppes (5%) Coastal sand dunes. Sand beaches. Machair (2%) Shingle. Sea cliffs. Islets (3%)
Tamar Estuaries Complex	SPA	The estuary system is a large marine inlet on the English Channel coast comprising the estuaries of the rivers Tamar, Lynher and Tavy, which collectively drain an extensive part of Devon and Cornwall. The broader lower reaches of the rivers form extensive tidal mud-flats bordered by saltmarsh communities which are vital feeding grounds for waterbirds. The Tamar Estuaries have been designated as a Special Protection Area for the protection of two Bird Species: • Little Egret: Egretta garzetta • Avocet: Recurvirostra avosetta

3. Stage II Pre-assessment Findings

3.1. Strategic Summary of Stage II findings

The following section (3.1) is a slightly adapted version (for a Cornwall IFCA context) of the summary findings presented in the Project Inshore Stage II report. This seeks to summarise the main messages and conclusions of the pre-assessment scoring exercise.

A significant issue for English Inshore fisheries is the lack of accurate fisheries information – both of effort and landings. There is no centralised data management for inshore fisheries, accessible to all relevant agencies, which ultimately undermines overall management.

Many of the problems identified in this pre-assessment of English fisheries stems from this lack of information. In some instances (informing P2 and P3) this could be rectified relatively quickly. Other aspects such as stock information may require time-series data and therefore require a long-term plan to develop an information base before the MSC standard can be met.

3.1.1. Principle 1

Principle 1 considers the status of a particular stock and the strategy adopted to harvest it. This therefore requires a clear definition of the stock, i.e. its geographical extent and the assessment and management units defined for it.

EU pressure stocks with a long term management plan in place and functioning as intended supported by full annual ICES assessments are likely to have relatively few obstacles to certification (under P1). The only exception to this is where stock status is below the limit reference point.

For many inshore resources targeted by fishermen in the Cornwall district the stocks are poorly defined. Without establishing appropriate stock units, management may be ineffective and can lead to uncertainty over management jurisdiction. Where stocks are poorly defined, the management authority needs to adopt a working solution, which is both practical and precautionary. This is part of the decision-making process more than a scientific process in most instances. Careful consideration is required to determine how the functional stock management boundaries of those English Inshore stocks should be defined.

The MSC risk based framework (RBF) can be used for data-limited stocks where status cannot be determined relative to reference points. The majority of English Inshore fisheries fall into this category, simply as a result of the fact that stock boundaries have not been defined and stock assessments are not carried out at the scale of the stock. However, most stocks which are commercially exploited but where stock status is uncertain are likely to score at high risk under the RBF. This does not mean that those stocks are overexploited or depleted, but merely that the risk of over-exploitation is such that good management can only be assured if based on more fishery specific information.

Even for highly productive species (typically bivalve) where it can be demonstrated that a risk from even a targeted fishery is low, it can still be difficult to demonstrate that the risk to future productivity of the stock will always remain low without management safeguards.

3.1.2. Principle 2

Principle 2 scores a fishery against five different elements:

1. Retained species,
2. By-catch (discarded species),
3. Endangered Threatened & Protected (ETP) species,
4. The habitat and
5. The ecosystem.

Adequate assessment is therefore only possible with good fishery specific information on the fisheries and associated habitat and ecosystem. Without fishery specific data, expert judgment,

qualitative information and analogous information can be drawn upon, but results in lower scores as the level of confidence in the information in relation to the subject fishery is inevitably lower.

To achieve scores of 80 or over (a clear pass rather than a conditional pass for scores between 60 and 80), quantitative fishery specific data is required. Fisheries which have supporting information based upon observer work which is able to detail full catch composition (rather than just landings) are therefore likely to score higher.

The nature of mixed fisheries in the Cornwall district and beyond means that many fisheries have the potential to retain a number of other species. In the scoring exercise the status of all the other species likely to be retained by the same gear in the same area are used to inform the status of retained species for a given fishery. By addressing all commercial species as potentially retained, only non-commercial bycatch species are treated as discards.

The scoring indicates that no single non-commercial discard species is likely to cause a fishery to fail, but there are some species that could be vulnerable to certain gears and where there is a need for more information. The same applies in the case of Endangered, threatened and protected (ETP) species. Any fishery wishing to move forward with MSC certification would benefit by developing a fishery-specific management policy for ETP species – this is something that could be coordinated at an IFCA level.

For the habitat criteria, scores are generally lower for mobile demersal gears, such as trawl, beam trawl and dredges. There are scale issues that have a significant bearing on some of the gears under Principle 2. The scoring is generally based on the impact of the full range of the gear, this often means that local inshore management measures are only credited where it can be shown that the fishery is spatially restricted (such as the case of the spatially restricted Thames cockle dredge fishery).

There is at least the potential for all fishing gears operating in Cornwall Inshore fisheries to pass MSC certification and in most cases examples of certified gear already exists somewhere. However for more impacting gears, the level of information and precautionary management required is likely to be considerably greater in order to demonstrate that management can ensure that impacts are not serious or irreversible. For these more impacting gears, such as dredges and demersal towed gear the low scores shown in the stage 2 pre-assessment do not necessarily present a barrier to certification, but they do indicate that further work may be required before full assessment.

3.1.3. Principle 3

Principle 3 considers two areas: general fisheries management and fisheries-specific management. The UK benefits from a comprehensive governance and legal framework (under the Common Fisheries Policy) meaning that overall scores in relation to general fisheries management are good. Although the commentary in relation to these applies to the EU and UK institutions and legislation, it is applicable to the local IFCA context.

The performance of fisheries-specific management is mixed. Where management is carried out at an EU level, then a fishery is likely to pass P3 (the only exception being where the international agreement has broken down, such as the current case with mackerel).

Also where fisheries are managed locally with the tools to limit exploitation, then fisheries also have the strong potential to pass P3. The most obvious examples of local fisheries with the requisite tools, information and management structures are those fisheries managed by Regulating Orders.

However a large number of fisheries sit between these two well-defined forms of management, being subject to management at a national, regional or more local (e.g. IFCA level), but with little evidence of fishery-specific management interventions.

Although IFCAs now have more effective tools to actively and adaptively manage inshore fisheries, the lack of information (and in some cases the lack of available resources or prioritisation) has

prevented appropriate management. For many fisheries around the English coast there is a lack of clarity about the precise division of roles and responsibilities, both between the EU and the UK, but perhaps more significantly between the MMO and IFCAs.

There are many finfish stocks which do not receive annual ICES advice and which do not have an EU TAC. For these stocks it is not always clear who will take a lead on management. IFCAs are understandably unwilling (and it may be inappropriate) to take action at an IFCA level that restricts local fishermen, while others outside the district are not restricted. For stocks extending beyond any single IFCA boundary (to neighbouring IFCAs and/or outside the 6mile limit) a clearer understanding of management responsibility and stronger (institutional) links between IFCAs and with MMO is required to determine appropriate management.

For stocks (in particular shellfish) which do not receive annual ICES advice and which do not have an EU TAC, but which are more geographically restricted there is likely to be a greater overlap between the stock boundaries and the IFCA boundaries. In these cases management by IFCAs can be based on sound local information, is more likely to receive the support of local industry and critically, is more likely to bring about the intended response.

3.2. (IFCA) Fisheries recommended for full assessment

According to the pre-assessment findings for Cornwall in stage 2 of Project Inshore[2] (accepting the, in some cases, data limited and therefore precautionary nature of a pre-assessment) there are 4 stocks fished within the district that offer the prospect of almost immediate entry into the MSC full assessment. These are:

1. Western Channel (VIIe) Sole,
2. Celtic Sea (VIIe-k) Sole,
3. Western Channel (VIIe) Plaice, and
4. Celtic Sea (VIIe-k) Cod

The pre-assessment exercise indicates that fisheries on these stocks are likely to pass both MSC Principle 1 (stock status and stock exploitation rules) and MSC Principle 3 (management structures and processes). How fisheries fare in relation to Principle 2 (impact of fisheries on the wider ecosystem) will depend on the gears that are included in the MSC assessment.

The pre-assessment scoring exercise indicates that fisheries for plaice and sole using static gears are likely to score best – in particular drift and trammel nets – indicating a likely pass at MSC full assessment. The same is also true for long-lined cod.

The indication from the pre-assessment is that gill net fisheries would score more poorly, but this result is mainly due to a lack of information, in particular in relation to catch profiles of other species. It is possible that an exercise to quantify the catch profiles of static gear nets could lead to increased scores.

For trawl and beam trawl there would need to be more supporting information to provide evidence that the gear does not pose a risk of serious or irreversible harm to both habitats and bycatch species, which may be possible to demonstrate in the longer term.

These species are far more widely distributed than the Cornwall IFCA boundary, and the CIFCA is not the primary management authority for these species, however this in no way precludes local fishermen from seeking MSC certification of these fisheries on these stocks. Due to the widely distributed nature of the stocks, there is the potential for a large scale Unit of Certification – for example, including all English Inshore static gear vessels fishing these Celtic Sea and Western Channel stocks. This will be explored further in section 5 of this report.

Some stocks targeted by Cornish inshore vessels have already achieved MSC certification. Cornwall sardine was assessed under the RBF as it did not have a quota and certified in 2010.

[2] For full details visit http://msc.solidproject.co.uk/msc-project-inshore.aspx?a=CW&s=

Conditions included developing a harvest strategy and by the fourth year of the certificate, appropriate harvest control rules are in place. South West hand-lined mackerel was one of the first certified fisheries in 2001 and was re-certified in 2007. However the handliners withdrew from the programme and with the issues surrounding international agreements, North East Atlantic mackerel fisheries are currently suspended from the programme.

3.3. (IFCA) Fisheries requiring additional action prior to full assessment

Aside from the 5 stocks referred to above, all other stocks and fisheries on those stocks have been identified as not currently meeting the requite MSC unconditional pass park and are likely to therefore require further work in order to demonstrate an assurance of sustainable management – in particular should any fishery wish to proceed to MSC certification.

3.3.1. Addressing Principle 1 – EU quota species

There are a number of species governed by EU quota, where science is coordinated at an international level (via ICES) and primary responsibility rests firmly with the EU, and within England, DEFRA and the MMO for application of management decisions. A number of these do not currently meet the P1 requirements. In some cases these may also have some associated weaknesses in P3 – in particular in relation to objectives and decision-making processes, where a long term management plan is missing. These include the most commercially important of the remaining stocks, including a large number of demersal finfish, all pelagic stocks and only a single shellfish:

Table 2:

Stocks of EU managed quota species with issues to address in P1 or P3

	Species	Stock
Demersal finfish	Plaice	Celtic Sea (VIIe-k)
	Cod	Eastern Channel (IV IIIa VIId)
	Ling	Southern (IIIa IVa VI VII VIII IX XII XIV)
	Megrim	Celtic Sea (VIIb-k)
	Monkfish / Angler	Western and Channel (VII b-k, VIII a/b/d)
	Whiting	North Sea and Eastern Channel (IV VIId)
	Skates & Rays (various spp.)	Celtic Sea, North Sea & Channel
Pelagic Finfish	Horse mackerel	North Sea
	Mackerel	NEA Mackerel
	Sprat	Channel (VIId,e)

Addressing the gaps highlighted in the pre-assessment for these fisheries under P1 and P3 is likely to involve coordination at an EU level. Though local management measures may contribute to international efforts, in particular through enforcement and good stewardship, these alone are unlikely to be sufficient to adequately manage the stocks.

3.3.2. Addressing Principle 1 & 3 - Non-EU quota species

In the section above, in relation to the EU quota species, the presence of internationally coordinated scientific advice and an EU quota provides an indication that a stock is primarily managed at an EU level. Where these indicators are absent the precise definition of management responsibility is less clear. This lack of clarity results in a lower score for Principle 3 in the MSC pre-assessment as it is typically associated with only implicit management objectives and unclear decision-making processes.

The stocks falling into this category may be more poorly defined (or undefined), including a number of demersal finfish and a large number of shellfish:

	Species	Stock
Demersal finish	Lemon Sole	Western and Channel (VII a/f/e)
	Witch	Western approaches (VII f/e)
	Dab	Channel (VII d)
	Flounder	Channel (VII d/e)
	Turbot	Channel (VII d/e)
	Bass	NE Atlantic
	Black Seabream	Channel (IV VII d/e)
	Grey Gurnard	Eastern Channel (IV IIIa VIId)
	Red Gurnard	Western (VIId–k)
	John dory	Western Approaches (VIIe-j VIII a,b)
	Grey mullet	Channel (VII d-f)
	Red mullet	Eastern Channel (VIId)
	Pollack	Celtic Sea and West of Scotland (VI VII a-c, e-k)
	Pouting	Undefined
	Smoothhound	NE Atlantic
Pelagic	Anchovy	South West
	Pilchard	South West
Shellfish	Scallop	Western Channel & Bristol Channel
	Crawfish	South West
	Cuttlefish	Channel
	Brown crab	Celtic Sea Channel
	Brown crab	Western Channel
	Velvet crab	Eastern Channel
	Native oyster	Channel
	Lobster	South West
	Spider crab	South West
	Whelk	Eastern Channel
	Periwinkle	Cornwall

Table 3:

Stocks of non-quota species with issues to address in P1 or P3

Addressing the gaps highlighted in the pre-assessment for these fisheries may still involve some international coordination, for example at an EU level, or it may involve national coordination (i.e. beyond the boundary of a single IFCA) or it may be possible to achieve stock level management (so addressing gaps in Principle 1 & 3) at a local IFCA level.

Subsequent sections of this report will therefore explore where IFCA management effort on the stocks can, and arguably therefore should be applied.

4. Scoping IFCA Fisheries

4.1. Key Management Responsibility

In this section the fisheries in the district are prioritised and categorised to consider both their local importance and local management influence and priority in order to strategically review IFCA management action.

As part of the Project Inshore Stage 3, the team has undertaken a further simple scoping exercise of the fisheries that occur in the Cornwall area, adding further parameters of importance to determining future management priorities. These are later cross-referenced with the results of the MSC pre-assessment process. The parameters used in the Management Scoping exercise were:

Table 4:

Scoping parameters and scoring for IFCA prioritisation

Scoping Parameter	1 - lesser local management priority	2	3 - higher local management priority
Value of landings	Graduated scale 1 = low value, 3 = high value		
Degree of EU Management	EU lead with defined quotas	EU / ICES involvement but no quotas	no fishery specific EU involvement
Stock boundary	Defined – widely distributed or migratory	Undefined & highly mobile	Undefined & sedentary
Local cultural & socio-economic importance	Occasional bycatch, no recreational catch	Commercial bycatch and occasional recreational catch	IFCA Priority Species (i.e. important commercial or recreational catch)

This exercise is focused solely on fish (both finfish and shellfish), and more specifically stocks, to help prioritise local stock management measures. It does not consider any site conservation or any gear impacts (at this point) and clearly the IFCA has many other important (and statutory) priorities which are outside of the remit of this scoping exercise. This exercise is simply to help focus in on the stocks which are locally important and which are best placed to warrant local stock management measures.

The results of this scoping exercise are contained in Appendix 2 of this report and are discussed in the following sections below, which distinguish between stocks that are widely distributed (and therefore less suited to local management in isolation) and those where local populations may be distinguished.

4.1.1. Stocks managed at an EU level

Relatively low ranking scores are found for stocks that are widely distributed, some of which may already be subject to EU quota management and science is already coordinated at an ICES level. Some stocks may well warrant additional management attention, but for these more widely distributed stocks it should be coordinated at an appropriate spatial scale of the resource; i.e. international, and the IFCA is not expected to take a lead on management.

REF _Ref248296765 \h Table 5 presents those species that fall into this category where landings from ICES rectangles including the Cornwall IFCA district by vessels under 15m (and therefore not solely from the offshore fleet) are significant (above £100,000 in 2010). It is notable that many of these species are non-quota species and therefore would face a number of challenges to certification. Addressing these information and management short-comings will be led by the IFCAs as these species are more widely distributed than just the inshore area.

Table 5:

Widely-dispersed species with significant regional landings (source: 2010 MMO data)

Species	Tonnage	Value
Lemon Sole	628	£2,476,210
Monks or Anglers	518	£1,468,334
Pollack	469	£904,122
Mackerel	774	£848,903
Haddock	410	£513,517
Turbot	55	£451,614

John Dory	61	£360,292
Sole	34	£358,455
Whiting	366	£326,156
Plaice	161	£242,305
Anchovy	254	£229,756
Cod	95	£199,313
Brill	25	£162,008
Red Mullet	19	£161,878
Blonde Ray	77	£150,400
Skates and Rays	55	£101,656

For these stocks the IFCA still clearly plays an important role both as a stakeholder and as a partner in management. The IFCA remain responsible for enforcement of relevant legislation on these fisheries within its district. In some cases there will be management measures, applied at a higher level, where the IFCA may even have primary responsibility – such as protection of inshore nursery grounds.

The IFCA has the power to act to further safeguard the resource, should they wish. However local measures applied disproportionately to local inshore vessels which do not result in overall stock benefits, are likely to be unpopular and may even be counter-productive, in particular in reducing support for management measures on other stocks where the IFCA is best placed to lead on stock level management.

It is suggested that management of the above species at a UK level is led by the MMO.

4.1.2. Species suited to local stock management

Some stocks fished within the Cornwall IFCA district are more suited to management at a smaller spatial scale such as an IFCA. Typically these will not already feature in any EU management, or any ICES science, other than in very general terms, such as general fleet technical measures, or general ecosystem science. As such the management is not dependent on the EU, so there is no barrier to IFCAs from engaging in stock management.

In general terms, the more sedentary the species, the more suited they are to local stock management measures. These would score 3 in relation to stock boundary and the potential for IFCA management influence. Of course there are other factors that are also importance in justifying the spatial scale of stock management, such as length of planktonic larval phases, or fishing patterns or even local bathymetry, and these will be discussed in more detail later, but as a simple proxy for scoping fisheries, it is the sedentary nature of the stocks which most lend themselves to local management.

Crab and scallop are less likely to fall into this category. In the case of crab they are more likely to migrate over longer distances, there is a significant fishery beyond 6nm and there is already some degree of international scientific cooperation, so they are less immediately obvious candidates for inshore stock management. In the case of scallop, again there is an important offshore fishery, with coordinated scientific effort but in addition there is more fisheries specific management – both at a national level (led by DEFRA) and an international level (such as the EU effort regime).

For the Cornwall IFCA the only significant fishery that currently matches these criteria is the native oyster in the Fal estuary, Fal Oyster. As of October 2014, management oversight for this fishery is via a new Regulating Order with management under Cornwall IFCA. This fishery was not part of the Stage 2 pre-assessment, but is considered further in relation to IFCA management later in this report.

4.1.3. Stocks of priority to Cornwall IFCA

For the remaining stocks, it can be concluded that current management action is less obviously

being led by either EU or national processes and that the species or fishery characteristics mean that they may not be candidates for inshore stock management. Nevertheless, the other criteria taken into consideration (landed value, socio-economic dependence) show that these species are priorities for the Cornwall IFCA.

Table 6 presents the results of a ranking exercise considering the various parameters listed in table 4. In terms of landed value (by under 15m vessels), crab, scallops and lobster are all well above £1million per annum. It is recognised that crab and scallops are likely to require management at a wider geographic scale than a single IFCA, but their significance to the inshore fleet is such that they remain a management priority. This is also true for sea bass.

Lobster is a more inshore fishery, though likely to benefit from co-ordination between IFCAs. Spider crab may be a similar fishery to lobster in terms, but there is not sufficient information on the stock to confidently determine the correct scale of management. As it is significant inshore fishery in Cornwall, learning more to ensure good management should be a further priority for Cornwall IFCA.

Pilchards are already MSC certified (Cornwall sardine) and specific management action is occurring for this fishery. Cuttlefish and squid are significant fisheries that may be prioritised in the future, but as the distribution of the stock is far wider than the IFCA and cephalopod fisheries are difficult to assess and therefore manage, these are not considered further in this report.

Table 6:

Priority species as identified by Cornwall IFCA

Species	Tonnage	Value	Rank
Scallops	877	£1,334,397	1
Lobsters	119	£1,195,706	2
Spider Crabs	341	£413,424	3
Crabs (C.P.Mixed Sexes)	1,621	£1,999,969	4
Bass	63	£543,956	5
Pilchards	1,382	£351,938	6
Cuttlefish	335	£744,272	7
Squid	72	£365,683	8

5. Preparations for immediate full assessment

For any stocks, fisheries or Units of Certification being considered for full assessment, it will be important to review the conclusions of the Project Inshore Stage II pre-assessment – both the report and the scoring database. Although generic, these contain a lot of useful information and insight into the scoring process. It will be important to address any 'gaps' identified to increase scores and better ensure a successful assessment process. It can also be useful to seek to increase scoring in some areas with no gaps – improving scores between 80 and 100, to increase the overall average scores for each Principle level.

5.1. EU Quota stocks ready for full assessment

5.1.1. Proposed UoCs & Overlapping IFCAs

The Project Inshore Stage II pre-assessment exercise reveals that some EU managed stocks landed in the Cornwall district are ready for full assessment. In providing advice as part of stage three, this list has been added to in anticipation of improved P2 scores for certain static gears on the provision of increased information of catch profiles. It is noted, however, that the specific static gear used will need to be specified. Some trawl fisheries for these stocks could also be certified, but as the main gears used to target these species in inshore areas are static nets, trawls are not identified as a priority here.

Table 7:

Proposed units of certification for MSC certification

Species	Stock	Gear
Cod	Celtic Sea (VII e-k)	Gill net
Cod	Celtic Sea (VII e-k)	Trammel net
Cod	Celtic Sea (VII e-k)	Long-line
Plaice	Western Channel (VIIe)	Gill net
Plaice	Western Channel (VIIe)	Trammel Net
Sole	Western Channel (VIIe)	Gill net
Sole	Western Channel (VIIe)	Trammel Net
Sole	Celtic Sea (VII f/g)	Gill net
Sole	Celtic Sea (VII f/g)	Trammel Net

The stocks listed in the above table all exhibit SSB above the target reference point (BMSY), but fishing mortality for Celtic Sea sole and Western Channel plaice remains above target (FMSY). Celtic Sea cod F is at target.

This has resulted in an increase in the initial number of Units of Certification of EU managed fisheries in a favourable position to enter the MSC assessment process to 9. Should there be other static gear catch combinations of the above stocks (although these are not reflected in MMO statistics) then these could also likely be included as a primary candidate for MSC assessment.

5.1.2. Opportunities for Stakeholders

For the static gear fisheries on sole and plaice in the Western Channel and sole, plaice and cod in the Celtic Sea, the Unit of Certification has the potential to be increased in size. The overwhelming advantage of increasing the size of the Unit of Certification is that the cost of assessment, surveillance and re-assessment is shared, effectively bringing individual costs down. A bigger Unit of Certification may also be able to exert greater leverage in order to achieve any conditions placed upon the fishery at the time of full assessment.

It would be possible for all English registered inshore fishermen targeting those species in the Western Channel and Celtic Sea to come together under a single assessment. As these stocks are not managed at an IFCA level and are fished outside of 6nm there is no particular advantage to restricting the UoC to a single IFCA. The only exception to this would be if it was felt that there were particular advantages in relation to P2 issues, such as reduced local habitat impacts or improved gear performance due to local byelaws.

So a single assessment could be used for all English Inshore Fishermen catching these stocks

using static gears. This single assessment would contain multiple Units of Certification (1 UoC for each combination of stock and gear). By combining many units of certification under a single assessment, the costs are also reduced. This could bring together inshore fishermen of Cornwall with fishers in Devon and Severn IFCA district.

With a larger assessment, or Unit of Certification such as this, it is important to consider who the client would be of any future assessment and what is the 'glue' that binds the individuals within the client group. This is particularly important in order to demonstrate that any commitments made (such as codes of Practice) are effectively complied with and any conditions resulting from the full assessment are enacted across the certified fleet. As such it is likely that fishermen's associations or the POs may be best placed to take a lead on first ascertaining the level of interest for any such assessment, and second on pulling together the funding and requirements to enable the full assessment process to begin.

Assessments led by P.O.s should not exclude inshore vessels because they may not be members. The certification is eased with all vessels operating in the fishery being included in the UoC managed by a client group and traceability is made easier. Stage 4 of Project Inshore is expected to explore who may wish to progress these assessments.

At least for the static gear finfish fisheries discussed here, it is not anticipated that actions would be required of the IFCA, other than highlighting the potential opportunity to fishers targeting those resources within the district, and possibly in assisting with preparation for full assessment.

5.1.3. Stakeholders to consult with in full assessment

The following is a preliminary listing of those bodies and interested parties that will need to be contacted during the consultation phases of assessment on fisheries managed at an EU level:

- owners and management of member vessels - provision of operational data and other data collected by the client;
- skippers and mates of member vessels - provision of operational data;
- fisheries managers – (MMO).
- various fishery research institutes involved with regional fisheries and regional marine management - (CEFAS)
- details of at-sea and port inspections, checks on recent fishing infringements, information on fishing practices and discards - coastguard and national inspection authorities;
- fishermen's / producer organisations - details of licensing, quota management and uptake, log book records, fishing practices;
- other environmental organisations and special interest groups. For static gear fisheries this could include the Wildlife Trusts and RSPB. It is our experience that it is best to include all possible NGOs with an interest in the stakeholder list, so they are aware of the assessment processes and have the opportunity to comment if interested.

5.1.4. Collection of supporting evidence

Supporting evidence is a crucial aspect of a successful MSC assessment process. The onus is on the client to provide supporting evidence to the assessment team as this will increase the likelihood of a successful outcome and speed up the assessment process (an important consideration as the MSC timeline conditions have been tightened, so delays can lead to failure to complete the assessment in the requisite timeline).

For both Principle 1 and Principle 3 for stocks managed at an EU level with advice from ICES much of the requisite information is already available. For P2 there is often a shortage of information which can lead to significantly reduced scores. It is therefore important to demonstrate:

- The catch profile of the gears under assessment, including the discard and ETP profile.

- The area of the fishery (ideally VMS or Succorfish – or informed estimates if these are not available for inshore vessels) compared to the habitat types.
- Any fleet level management initiatives – such as gear modifications to reduce impact, Codes of conduct designed to minims impact, reporting requirements to demonstrate reduced impact, reports from observers, membership of responsible fishing schemes etc.

5.2. Locally managed fisheries ready for full assessment

5.2.1. Proposed UoCs & Overlapping IFCAs

The locally-managed fishery that may be suitable for MSC certification is the Fal Oyster fishery. A new Regulating Order is to be submitted to DEFRA, but following this transition period, assessment could commence if there was interest from the fishermen involved.

Traditional sailing vessels and rowing boats under annual license are currently the only vessels to prosecute the Fal oyster fishery. Therefore while the fishing method is using dredges that are towed across the sea bed (and so causing some benthic impact), this is a low intensity fishery as there is no motor power used to harvest the oysters.

Protected Designated Origin (PDO) status is already given to Fal Oysters, defined as “oysters caught in the designated area using only traditional sailing and rowing vessels between the period of October 1st and March 31st”.

The area where the Fal Oyster is produced can be described as within the Truro Port Fishery. The legal limits of which are described in the fishery order (1936 amended 1975) as all those parts of the Truro and Falmouth Harbours and of the bed of the Truro, Fal and Tresillian Rivers.

The fishery is therefore temporally and spatially very well defined with the requirement for ‘Live Shellfish Movement” documentation providing good traceability procedures. A minimum landing size enabling the individuals to spawn prior to first harvest is a method to prevent overfishing.

5.2.2. Opportunities for Stakeholders

For the oyster fishery, the proposed Unit of Certification for any full assessment would be spatially restricted and restricted to the licence holders in the Regulating Order Fishery. Catches of oysters from outside the Regulating Order would not be expected to pass an MSC assessment at this stage. As such the Unit of Certification would be entirely within the IFCA district and no liaison with other IFCAs is required.

The most appropriate client and funding arrangements for any full assessment are more ambiguous and ultimately this is a commercial or management decision. Licence holders in the fishery or processors or the product may both have a commercial interest in taking the fishery into the assessment process, although this depends very much on the market – and is likely to change over time. By contrast managers (i.e. the IFCA) may have interest in being the client for the fishery assessment process (even if not the primary funders) in order to demonstrate good management. Either route is possible and both would be acceptable.

5.2.3. Stakeholders to consult with in full assessment

The following is a preliminary listing of those bodies and interested parties that will need to be contacted during the consultation phases of assessment on fisheries managed at an EU level:

- owners and management of member vessels - provision of operational data and other data collected by the client;
- skippers and mates of member vessels - provision of operational data;
- fisheries managers – (Cornwall IFCA).
- various fishery research institutes involved with regional fisheries and regional marine management - (Cornwall IFCA)
- details of at-sea and port inspections, checks on recent fishing infringements, information on

fishing practices and discards - coastguard and national inspection authorities;

- fishermen's / producer organisations - details of licensing, log book records, any additional requirements of the regulating order;
- environmental organisations and special interest groups. For dredge fisheries this should include Natural England and RSPB. It is our experience that it is best to include all possible NGOs with an interest in the stakeholder list, so they are aware of the assessment processes and have the opportunity to comment if interested.

5.2.4. Collection of supporting evidence

Supporting evidence is a crucial aspect of a successful MSC assessment process. The onus is on the client fishery to demonstrate their sustainability. Any supporting evidence provided to the assessment team is likely to increase the likelihood of a successful outcome and speed up the assessment process (an important consideration as the MSC timeline conditions have been tightened, so at worst a delay could lead to failure to complete the assessment in the requisite timeline). For P1 the following information should be provided:

- Stock assessments & details of stock assessment methodologies*
- Details of overall harvest strategy and harvest control rules
- Empirical basis for harvest control rules and reference points used to set exploitation rates
- Details of additional studies on stock identity, sources and sinks
- Details of either internal or ideally external peer reviews undertaken on stock assessment and overarching harvest strategy and control rules

*The harvest control rule may currently only be the Minimum Landing Size (preventing harvesting before spawning), but this is likely to require further elaboration as a condition of certification.

For P2 there is often a shortage of information that can lead to significantly reduced scores. Dredging can have a significant impact on the habitat (seabed substrate). With such as small, confined fishery this issue may be less significant than in other widely dispersed dredge fisheries, but presenting good information on this aspect will still be important. As a minimum it will be important to demonstrate:

- The catch profile of the gears, including the discard and ETP profile.
- The area of the fishery in relation to the habitat types encountered.
- Habitat impact studies and appropriate assessments
- Evidence of conservation status of any vulnerable habitat forming species
- Any additional management measures, in particular aimed at reducing or mitigating habitat impact.
- Any fleet level management initiatives – such as gear modifications to reduce impact, Codes of conduct designed to minimise impact, reporting requirements to demonstrate reduced impact, reports from observers, membership of responsible fishing schemes etc.

For Principle 3 almost all of the scoring in the second half of the scoring tree relates to 'fisheries specific' criteria. This means that local actions and information will be the key determinant of scores, so preparation should focus on these areas, in particular:

- A management plan for the fishery under assessment. This will comprise the Regulating Order itself. It is important that this sets out the overall objectives for the management and the processes by which management decisions are taken.
- Provide details of how management decisions are consulted on and how the results of consultations are addressed.
- Provide evidence of local enforcement and any issues of non-compliance

- Provide a fishery specific research plan, or highlight how research for the fishery is included in the wider IFCA management plan
- Provide details of any external reviews of the management process or any periodic evaluations. Reviews when renewing the regulating Order are an example of this and for 2014 may be very timely for this fishery.

6. Developing IFCA Stock Management

6.1. Candidate fisheries for improvement

6.1.1. Value, cultural importance, IFCA key species

The candidate fisheries for a Cornwall IFCA led approach to stock management are:

- Crab
- Lobster
- Spider Crab
- Fal Oyster

These are all of a substantial local value, both in terms of first sale value, but also in creating both upstream and downstream economic benefits. They are also of cultural importance with the species having a local reputation and market and are an important element of the inshore fisheries regional livelihood. These species are not currently subject to any international coordinated science (through ICES), but crab and lobster are now assessed by Cefas at a regional level.

Additionally these species (with the exception of Fal Oyster) are not subject to any fishery specific national or EU controls, other than more general gear specification, licencing and a minimum landing size. In short stock level management is not likely to be driven by an EU-led approach, nor would such an approach be appropriate.

If stock level management is to be applied it is most likely to be applied at a local or regional level. As such these species are good candidates for IFCA-level stock management.

Scallop and sea bass are not listed for IFCA-led stock management, despite these also being identified as IFCA priorities. This is due to the broader distribution of these stocks. Local management of these fisheries is still necessary (particularly the management of local scallop beds and recreational sea bass fisheries), but the lead on stock management is likely to be at a national or international level.

Bass is now the subject of ICES advice for Irish Sea, Celtic Sea, English Channel and Southern North Sea (ICES, 2013a). The extent of the stock and the fishery interests including pair trawlers from several EU nations suggest management under the CFP is appropriate. Management of the significant recreational fishery (estimated to account for 20% of the catch) may be implemented at an IFCA-level, but should be developed under international management to ensure consistency.

Scallop management has also recently been subject to international scientific co-ordination. The first ICES expert working group met in Dublin in September 2013 and this new WG Scallop is due to report in February 2014 (ICES, 2013b). UK devolved administrations have progressed scallop fishing orders with somewhat differing measures to manage scallop fisheries within these devolved waters. There has clearly been much effort by IFCAs to manage scallop fisheries in relation to European Marine Sites. This management of habitat impact should, however, be clearly distinguished from stock-level management of the fishery considered here. However, the IFCA efforts to map and manage habitat interaction provide clear evidence applicable to Principle 2 considerations. As is currently the case, more restrictive management could be implemented by the IFCAs if deemed to be necessary and effective in achieving desired outcomes, but these are not likely to be related to stock management. This local management of scallop effort within 6nmiles should be factored into overall national management of scallop fisheries.

6.1.2. Rationale to support local stock management

For English Inshore fisheries that are considered the best candidates for inshore management (led by the IFCAs) there is an immediate question to define the extent of the stock, or more accurately determining the working hypothesis to underpin the determination of the stock. Management will initially be faced with uncertainty about the range, distribution, life cycle and population dynamics of stock and may also be confronted by the fact that the perceived stock range does not exactly overlap with existing management jurisdictions.

Spatial genetic discreetness is unlikely to coincide with jurisdictional boundaries, so at some point managers must make pragmatic decisions to enable management to proceed. Seeking definite evidence based solutions from science will (and has) lead to delay and may result in scientifically accurate, but practically unmanageable conclusions, which are most likely to result in a lack of management action. By contrast, if IFCA managers state which important local fisheries they believe can be managed locally, within their jurisdiction and present the practically minded management rationale to support this, then it paves the way for precautionary stock level adaptive management to begin. By clearly identifying the working hypothesis about stock structure, or 'management units', the approach to management is open and transparent and clearly highlights uncertainties, enabling these to be periodically reviewed by management evaluations. Should these assumptions be found to be incorrect, then the scale of the management unit can be adjusted.

Lobster (Homarus gammarus) is already the subject of Cefas assessment, which has set the assessment at a regional 'South West' scale covering Cornwall, Devon & Severn and Isles of Scilly IFCA districts. It therefore appears appropriate that management of this fishery be developed in collaboration with these IFCAs.

Crab (Cancer pagarus) is also assessed by Cefas in terms of a Western English Channel and a Celtic Sea stock management unit. Cefas notes that, "Stock boundaries for edible crab remain poorly understood and both sexes move quite widely at times; females in particular have been shown to travel large distances in relation to spawning activity." Based on the assessment units, however, collaboration between the relevant IFCAs to develop crab management appears sensible. The extent of the fishery and offshore fishing interests (vivier crabbers) suggests some discussion with French and Irish authorities would also be beneficial for Western Channel and Celtic Sea stocks respectively.

The **Spider crab** (Maia squinado) fishery (targeted by net and pot, along with bycatch in the tangle net fishery) is based on an annual migration from offshore into shallow sandy areas during April through to August, peaking in May & June (CSFC, 2007).

The **Fal Oyster** fishery (also called the Truro Oyster Fishery) is a regulated fishery for native oyster (Ostrea edulis) in the Fal Estuary. The oyster season starts on the 1st November and closes on the 31st March, the working hours are 0900hrs to 1500hrs Monday to Friday and 0900hrs to 1300hrs on Saturday. The oysters are wild and propagate naturally, consequently the stock size fluctuates from season to season. To prevent over-fishing a minimum size of 67mm is imposed and Cornwall IFCA is responsible for policing this. All dredgers must be licensed, but there's no restriction on the number of licences that can be issued. The fleet size has varied from a peak of perhaps a few hundred during the 1800's to a current size of 10 to 25 boats according to how good the oyster season. The managed fishery produces around 50 tonnes of native oysters per year (Cefas, 2010). In 2010 50 licences were issued to individuals.

6.2. Characteristics of successful management

The following section discusses some of the characteristics of successful management. Many of these characteristics are directly linked to MSC performance criteria, and for simplicity they are set out in the order of the MSC Principles, but some others are less explicitly stated in the MSC model.

6.2.1. Principle 1

Principle 1 introduces the idea that successful adaptive stock management should seek to understand and manage all fishing mortality upon that stock, or management unit. This includes all catches from all fleets, any mortality of discards and any unreported landings. The following characteristics are of key importance:

Clear management units

It is essential for management to clearly identify what it is managing. Where are the boundaries to the stock or management unit that is being managed and what is the rationale or assumptions on which this management unit has been defined? By clearly stating the assumptions, these are

openly acknowledged and can be tested over time with monitoring and evaluation.

Collection of appropriate information

Information for adaptive stock management should be tailored to the needs of any stock assessment or management analysis. Where fishers are involved in the collection of information, the reasons for the data collection how this information is used should be explained. Data should be collected at an appropriate spatial scale – to correspond to the management jurisdiction. Though overall responsibility for collection of landings data remains with the MMO, it is important that IFCAs access the information that they need for management. Ideally data would be collected in computerised form, and, as will be seen later, any data that includes historic time series is also useful in informing assessments.

Understanding of stock status

An appreciation of stock status is essential for good management. It is possible to make precautionary, informed and adaptive management based on simple assessment models. An increased level of precaution needs to be built into management decisions if based on less robust science.

A pre-defined adaptive management response

In simple terms, a harvest control rule (HCR) simply states what stock level the fishery is targeting, what measures will be used to reach there, and at what points (reference points) will appropriate and timely management actions be taken to return a fishery to target reference points. The MSC standard provides more description and requirements about the exact characteristics of these rules, but the key Principle is that they are transparent and pre-determined. This means that negotiations over management response are objective and do not occur at times of reduced catches, as the appropriate management response is determined before a need arises.

Transparent decision rules with stakeholder buy-in

Engaging stakeholders in the process of determining the harvest control rules greatly enhances the likelihood that these rules will be adhered to and eases their implementation. In some cases this may also allow economic considerations to be included in the decision making process – provided this is not seen to be anti-competitive and it can be demonstrated that management actions are taken before there is a biologic risk to the stock. Working with stakeholders to agree on decision rules also means that stakeholders, in particular fishers, have a better understanding for the reasons of management action.

Review & Evaluation

It is important that the performance of the management system is regularly and comprehensively reviewed, considering inter alia:

- Is the stock responding to management actions as expected?;
- Are the underlying assumptions appropriate?;
- Are the tools used to set the exploitation rate appropriate;
- Is the stock assessment model appropriate or should others be tested?

The most regular review cycle can be an internal exercise but having an external review often provides the benefit of fresh perspective and consideration of alternative approaches. This is part of the ongoing process of management refinement and improvement. In stage 2 the project team considered the annual planning amounted to regular internal review with MMO/DEFRA oversight providing sufficient external review.

6.2.2. Principle 2

Principle 2 considers the impacts of fishing gears on the ecosystem. In an MSC assessment this would be specifically the gear that is under assessment (and defined in the UoC) however for a

wider fishery management remit, as might be included in a fisheries management plan it may be more appropriate to consider the impact of all gears targeting the resource in the management area.

Data – discards, ETP interactions and ecosystem impacts

In preparation for a full assessment, provision of appropriate data of gear impact (ideally independently verified, or in some cases based on risk assessment) will assist in the scoring process. Data enables managers to make changes where warranted, but equally it may provide support for managers not taking precautionary management action, where it can be demonstrated that it is not necessary.

As IFCAs have marine conservation responsibilities, particularly in relation to the management of European Marine Sites and MCZs, gathering information on the specific impact of a fishery on other species, habitats and the wider ecosystem will be important to justify site management as well as fisheries management.

Information of ecosystem characteristics / distribution

Information about the ecosystem in which the fishery takes place can provide an understanding of changes over time. In many cases this information will already exist (for example through national habitat mapping projects), in which case it would not be necessary for local managers to undertake additional primary research.

Understanding of spatial distribution of fleet (appropriate to scale of potential impact)

It is important for managers to understand where fishing takes place so that the relationship with the underlying ecology can be considered. However this understanding only need be appropriate to the scale and intensity of the fishery. Before requiring all vessels to have VMS, managers should be clear on why this is required. In collecting data for Principle 1, capturing a spatial element can be useful for understanding catch per unit effort patterns. This can also help identify changes in fleet patterns over time. Inshore fishers are themselves increasingly keen for their spatial patterns to be understood and recorded, both so they can demonstrate that certain vulnerable habitats may already be avoided or for highlighting commercially important fishing grounds in time of increasing competition for space with other marine industries.

The main reason for progressing inshore VMS (as is proposed in IFCA bylaws) is for environmental management, rather than fisheries management. In addition to supporting the management of European Marine Sites, this development will provide valuable information to fisheries management if this can be linked with fishing effort & catches.

Review mechanism to allow for management action in event of ecosystem impacts or risk caused by fishing (supported by decision rules where appropriate).

As with Principle 1, some form of review is an important pillar of management. This enables managers to review available information and be assured that the management in place is appropriate. Management can propose an action (spatial, temporal or technical) and there should be a process to review the response to that management action.

Codes of Conduct – industry led

In a number of MSC certified fisheries some form of Code of Conduct has proved valuable. In some cases this simply sets out what existing good practice is.

Cornwall IFCA notes the following codes of practice are already in place:

- Incidental Capture of Cetaceans.
- Red Mullet Netting.
- Net Fishing in St Ives Bay.
- Winkle fishing.

A full MSC assessment would seek quantitative understanding of such impacts and in many cases this may show that the impact is less than that perceived. A Code of Conduct provides a valuable opportunity for the fleet to set out how they ensure that perceived impacts are indeed minimized. Where a Code of Conduct calls for action by the fleet, consideration should be given to how it can be verified that the fleet is indeed undertaking that action.

6.2.3. Principle 3

Principle 3 assesses management structures and processes to ensure Principles 1 and 2 are delivered to ensure a sustainable fishery. There are some important characteristics of good management that are not contained in the MSC Principle 3, but which should none the less be part of the management consideration. In particular notions of capacity and profitability are not explicitly mentioned. Fisheries with excess capacity or fisheries that are not profitable are less likely to succeed and less likely to engender a sense of stewardship. Other characteristics of successful management in Principle 3 are:

Limited entry / ring fencing / community ownership / stewardship of resource

Management, which may limit access to the resource, must be fair, non-discriminatory and equitable. Ideally this should also set out possible routes for new entrants to join the fishery. Some form of limited access is likely to greatly increase the sense of stewardship in the resource. The increased sense of stewardship can increase the role that informal approaches such as peer pressure can play in enforcement, stimulating good compliance and at best, reducing costs of enforcement.

A useful consideration is what would happen to exploitation patterns (and how much control would managers have over that) if the price were to double. If it is concluded that many other boats not previously in the fishery would come and exploit the resource and the management system allows this, then the management is unlikely to succeed in meeting its objectives.

Stakeholder engagement in management process

Inshore fisheries management has great potential to engage fishers in the management process. This is not only about obtaining appropriate and accurate fisheries data, but also in engaging them in the development of rules and critically in providing feedback on management. Regular fishery meetings between managers and fishers play an important role in engaging fishers in the process of management. This can be an opportunity to provide update on stock status, outline any changes to management rules and the reasons for any such changes and highlight any enforcement priorities. It is also an opportunity for managers to listen to the concerns, ideas and information from the fleet. This addresses many of the MSC criteria relating to consultation, provision of explanations for how information is used, understanding of management processes etc.

Define fishery specific objectives and decision-making processes

Explicitly stating how management decisions will be taken is important to determining the overall success of management. Part of this will be about setting the Principle 1 harvest control rules into a wider management context; how will the rules be applied, by whom, how often and when? However there may be many other management decisions; how many permits should be issued; how should allocation occur; what gears should be permitted; what area or seasonal closures (if any) should apply; what technical conservation measures should be in place; what will the enforcement regime be; what are the sanctions for any infringements; what is the consultation and appeals process?

Typically decisions are taken in the context of pre-stated objectives and the success of management decisions should be judged against how well those decisions deliver against objectives. So as well as setting out the decision making process, the management plan should clearly highlight what the objectives are. Some of the High Level Objectives, set out in either the Marine & Coastal Access Act (2009) or the DEFRA guidance to IFCAs will of course apply, but local level management allows for more locally specific objectives to be included.

Research and information collection tailored to the needs of management

For management units to be managed locally, the availability of research capacity and funding is essential. It should be clearly identified what scientific support is available from CEFAS and how IFCAs feed into this process. Clearly for some stocks, in some areas CEFAS has taken an active lead (crab, lobster), but this could be supplemented by fishing-dependent data that may be collated by IFCAs. The management plan should clearly define the need, the approach, the resources and where responsibility lies. This should help to identify any need for local capacity building in research, or budgets to be allocated to research as required.

Management & enforcement appropriate to the scale (and risk) of the fishery

Enforcement should be appropriate to the scale of the fishery, but management will need to determine what that is. The MSC standard introduces the notion of informal approaches to enforcement, where the design of the management system engenders a sense of stewardship. This is also advocated in DEFRA guidance to IFCAs.

Review and Evaluation

Finally, as with both Principle 1 and Principle 2 there is a requirement for periodic review and evaluation of the performance of both the parts of the management system (for example, control & enforcement or data collection) and a holistic evaluation of how the constituent parts of the management system are working together to deliver the management objectives. Review and evaluation can be done 'in house' but valuable lessons can also be learned from inviting external review. Peer review by other IFCAs is expected to occur for the fisheries being managed across IFCAs.

6.3. Approach to developing stock management

The following approach to developing local adaptive stock management is intended as a guide, for stocks where the IFCA are best placed, and wish to take a lead in adaptive stock management. These steps are ordered in a more chronological order, illustrative of the management process, rather than by MSC Principle as in the previous section.

This focuses on management of the stock, rather than management of the impact of the fishery on the wider environment, but these considerations are expected to be part of the IFCA management process in line with the environmental management remit of IFCAs.

For each stock that the IFCA intends to lead on adaptive stock level management the IFCA should produce a Fishery Management Plan. The approach set out below should be used in the development of the Fishery Management Plan.

6.3.1. Management unit

For English Inshore fisheries that are considered candidates for inshore management (led by the IFCAs) there is an immediate question to define the extent of the stock. Management will initially be faced with uncertainty about the range, distribution, life cycle and population dynamics of stock and may also be confronted by the fact that the perceived stock range does not exactly overlap with existing management jurisdictions.

The exercise of determining the rational to support local stock management should be done by managers using the expertise within the IFCA team. For the species such as those selected in the scoping exercise – crab, lobster, spider crab, it is appropriate to manage as joint management units with other IFCAs. Crab and lobster already have defined stock assessment units pointing to regional management. The rationale for defining the extent of spider crab should be examined more thoroughly (including extent of migration and spawning/settlement behaviour) as an initial step in a stock specific fishery management plan.

It should also be demonstrated how and why this management unit is precautionary. If the assumption is incorrect, management would respond to a declining stock status, but would fail to halt the overall decline, but critically this would still mean that management was taking the correct

response in their jurisdiction.

It is also important to ensure that management is coordinated at appropriate scale to the fishery. As well as collaboration with neighbouring IFCAs, managers should consider the level of coordination with the MMO to address the management of resources outside 6nmiles. This also enables the sharing of best practice, a testing of underlying assumptions and awareness of any issues arising in neighbouring management units.

6.3.2. Information

Firstly, map what data are already available for use. What are the most recent landings data and are these appropriate to the scale of the chosen management unit? Do data capture inshore fishers' landings and effort accurately? What other useful information is available? Processors will often hold useful data, such as volumes landed, proportions of different size grades over time, length–weight ratios etc.

Secondly, management will need to tailor on-going data collection to the needs of management and use in HCR calculation (landings / effort / size) and / or other proxies. This should ensure that data are collected at the scale of the fishery management unit (jurisdiction) and that other fisheries mortality (recreational / discards) is either collected or estimated. For example, though overall responsibility for collection of landings data remains with the MMO, it is vitally important that IFCAs access the information that they need for management. Ideally data would be collected in computerised form, and, as will be seen later, data that includes historic time series are also useful in informing assessments.

6.3.3. Develop Draft HCR

Appendix 3 of this report provides a detailed explanation of this step of the management process including case study examples which detail the process of developing an appropriate stock assessment for local inshore resources and using this to inform the selection of appropriate empirically-justified reference points which are then incorporated into a harvest control rule.

Once the assessment and the reference points are established the next step is to define the management actions that will be taken at each of those points to ensure an appropriate rate of exploitation. These tools or measures could include closed areas, seasons, temporal curfews, pot limits, effort restriction, quota, MLS or technical measures, provided in each case that these can be demonstrated to manage fishing mortality as intended. In particular it is important to define the level of fishing effort at the limit reference point.

It is important that there is stakeholder review and engagement in the drafting of the HCR. One useful approach is to use simulations to help explain scenarios and increase stakeholder understanding by providing clear explanation of proposed management response. By secure stakeholder buy-in, the chances of successful implementation are greatly enhanced.

The final element of the HCR development and testing process should be to define how often, how and by who the HCR should undergo testing and evaluation of performance.

6.3.4. Develop management framework

Once a stock assessment is in process and reference points and harvest control rules are in development or consultation it is important to place these tools into a wider fisheries management and legislative context. In many cases the development of a specific **Fisheries Management Plan** is the ideal vehicle for providing this wide context and setting out the overarching management policy and process, as well as detailing the more specific management measures.

A Fishery Management Plan should begin by stating the overarching objectives. These are likely to include the High Level Objectives, set out in either the Marine & Coastal Access Act (2009) or the DEFRA guidance to IFCAs, but local level management allows for more locally specific objectives to also be included. This should state both short term & long term objectives and state how these will be measured. This could include social and should include ecosystem objectives (MSC Principle 3 requires that management includes ecosystem objectives). It is also worth explicitly stating in the

management framework what will be the approach to precaution, i.e. where data are lacking.

The management framework needs to highlight any needs for linking with other jurisdictions. For most inshore resources, where stocks will be managed adaptively by IFCAs, it is likely that the resource is also fished in the neighbouring IFCA. It is best practice to engage with the neighbouring jurisdiction so that each can be aware of management actions and share stock evaluation with the other jurisdiction.

As well as detailing the reference points and the harvest control rule, the management plan should also detail how the HCR will be applied – by whom. Sensibly, for locally managed stocks such as these this would be done by the IFCA.

The fishery management plan should detail the management decision-making process and cycle (ideally this should fully involve stakeholders). Where does ultimate responsibility for decision-making lie? What information will decisions be based on? How will decisions be informed by consultations? How will decision making process respond to information presented? One successful approach in a number of more locally managed fisheries is to develop a **fishery working group**. Even if this body does not have decision-making powers, it can play a vital advisory capacity and be the recognised conduit for stakeholder engagement in the management process.

Another important element of management is communication – how will decisions and the reasons for those decisions be widely communicated to interested parties? Again transparency is a key principle for such local stock management initiatives. Sensibly such a body would be engaged early on in the development of the Fishery Management Plan and perhaps coordinate wider stakeholder engagement in the various stages of HCR and management plan development.

6.3.5. Define management actions

The decision-making entity should, via a consultation process give consideration to the requisite management measures. This is linked to the development of the harvest control rules, and the selection of measures, which can be used to manage fishing mortality in relation to target reference points. However, other management measures may be included which are not directly linked to the harvest control rule. For example, these may be considered simply good and precautionary practice, or may already be successfully adopted bylaws, or may warrant inclusion in order to meet some of the wider management objectives, such as reducing impacts on other ecosystem attributes, or reducing conflict with other users of marine resources.

A likely key consideration is whether there is a need for some form of permitting or limited entry. This is likely to be required for most fisheries, partly as the permitting process is a tool to introduce flexible (adaptive) conditions of entry in the fishery, for example reflecting management response to changes in outcome status. This also plays an important role in engendering the sense of stewardship, which is an important step toward successful inshore management. However, if such an approach is not required, then it should be stated why it is not required, by illustrating that management retains the capacity to appropriately respond to changing stock status (or P2 ecosystem conditions).

When selecting measures and tools to control participation in the fishery (permitted / restricted vessels, gear, seasons, area, technical measures, move on rules etc.), best practice is to consider how selection of those measures may positively incentivise responsible fishing. A good management planning process will consider likely behavioural responses to management measures and seek to avoid loopholes or perverse incentives.

6.3.6. Determine Management Oversight

Management can only be effective with appropriate information feedback. Routine monitoring of fishery performance is needed to inform the on-going and timely calculation of the harvest control rule, so that management can be applied as required. The Fishery Management Plan should define this process and data should be collected at an appropriate scale and in an appropriate form. Consider how best to engage stakeholders in the information collection process

Most fisheries require some form of enforcement of management rules. At best a system may be self-policing when management design leads to strong stewardship or incentives that reward compliance. However, it is likely that some more formal enforcement will be required. The fishery management planning process should therefore consider the risk factors for non-compliance and demonstrate how the enforcement strategy is tailored to address these risks. The Management Plan should also set out the penalties, in order to demonstrate effective deterrence, but also stipulate the right of appeal.

As historically the enforcement of logbooks and landing declarations has been the role of the MMO, it is important that the IFCA give explicit consideration to how the verification of landing declarations will work for locally managed resources as any additional landing requirements (resulting from local management) will be outside the remit of the MMO.

6.3.7. Institutional, capacity & funding requirements

The resource implications associated with proposed future management activities maybe significant and have the potential to exceed the current capacity of the IFCA, especially given the existing on-going commitments described in section 2.4 of this report.

The fisheries management planning process should therefore consider what will be the costs of management and how will these costs be met? Could an externally funded Fishery Improvement Plan (FIP) process be developed to drive the process and reduce additional demands placed on IFCAs?

It may be important to therefore consider what if any external funding opportunities may be available for specific programmes and to what extent the requirements of management can be addressed within exiting budgets.

Stage 4 of Project Inshore will continue until 2015. During this stage the MSC English Fisheries Outreach team will be focussed on providing support for those fisheries wishing to move into full MSC assessment. This has the potential to engage with those fisheries in a position to almost immediately enter the assessment process (section 3.2 of this report) and discussing how best to form client groups, how best to address any remaining issues in preparation for full assessment and importantly to explore possible funding options. In addition the outreach work of Stage 4 might include working with IFCAs for those fisheries where the IFCAs are embarking on the process of stock management and provide support both in that process and in interpreting the results of stage 2 and the advice of stage 3.

6.3.8. Reviewing & Improving Management Performance

As well as routine and on-going monitoring needs, designed to ensure oversight of the fishery, there may be additional research requirements. A research planning process can be an important part of the wider management planning process and is an opportunity to consider gaps in knowledge and the research needs of management. In the context of the IFCAs, it is vital that in developing fishery specific management plans for those management units which can and will be managed locally that it is clearly understood at the outset what research capacity and funding is available. Consider what scientific support is available from CEFAS and to what extent IFCAs will be charged for this. Clearly for some stocks, in some areas CEFAS take an active lead, but the management plan should define where responsibility for research lies. This should help to identify any need for local capacity building in research and budgets to be allocated to research, all as part of the management cycle.

Monitoring and evaluation of management performance is necessary regular task. The process, timing and capacity needs for such evaluations should be set out in the management plan. As local management of priority stocks will be shared across IFCAs, there will be the opportunity to periodically review the overall performance of fishery specific management and sharing best practice. DEFRA review of IFCA performance provides regular external evaluation.

It is also important to engage stakeholders and in particular fishers in this process of management review, so that there is a wider understanding of how management is succeeding, or otherwise. An

annual fishery stakeholder meeting has proved successful in many fisheries for this process.

6.3.9. Establish Management in Legislation

Once the above stages have been brought together into a Fishery Management Plan, the next stage of the process is to set key aspects into legislation. Not everything requires legislation, but the framework, process and key technical aspects may be best supported with formal regulation. Whether or not the fishery management plan would be referred to in legislation will be determined on a case-by-case basis and in some cases it may be simpler simply to define key aspects in legislation.

The byelaw making powers defined in the Marine & Coastal Access Act (2009) is the main process of making the management measures contained in the Fishery Management Plan legally binding. In some instances the Sea Fisheries (Shellfish) Act 1967 may be the appropriate vehicle to establish either a Regulating or Several Order, although this is a slower process, which may not be necessary if the byelaw making process allows sufficient scope for introducing adaptive permitting, or any other such measures deemed appropriate.

Section 155 of the Maritime and Coastal Access Act (2009) empowers IFCAs to make bylaws in order to carry out their duties, although these do not come into effect until confirmed by the Secretary of State[3]. Section 156 of the Act sets out the types of management measures that may be taken, which provides managers with an extensive range of possible measures which includes:

- Restrictions on gears, vessels, seasons or areas,
- Permits and the ability to both charge for and limit the number of permits
- Ability to limit the amount taken by either individuals or vessels
- Ability to require certain data collection and monitoring measures

Section 157 of the Act introduces the possibility for byelaws to include different provisions for different cases or different circumstances, including (in particular):

1. different parts of an IFC district;
2. different times of the year;
3. Different descriptions of sea fisheries resources.

Section 157 part c in particular indicates that the byelaw may include provision to adapt management measures in response to different stock status indicators. This appears to pave the way for introducing harvest control rules, relative to reference points, indicting what management measures would be taken in event of changes in stock status.

Use by IFCAs of these increased powers, including this apparent scope for introducing adaptive fishery management measures, remains relatively untested since the act came into force in 2009. If the management of local stock units are to be effective and adaptive, (and if required, also meet the Principles and criteria of the MSC), then IFCAs should use these additional powers.

[3] Although section 157 of the act does give the IFCAs powers to make emergency byelaws in event of urgent need or unforeseen circumstance, it is anticipated that this would be the appropriate route by which to introduce adaptive management measures for local stocks.

7. Developing management for priority fisheries

7.1. Potential responses to pre-assessment issues

The following tables present suggested actions in response to the issues highlighted by the pre-assessment specific to the priority stocks identified. At first sight these measures appear extensive, but many are applicable across all the SW fisheries and so can be tackled together and through the development of joint management plans involving all relevant IFCA districts. Those related to P1 for crab and lobster are for consideration by CEFAS.

Key

Recommended for FA	Conditions Likely	Challenges
›80	60-80	‹60

7.1.1. South West Crab - pots

Summary results

Pre-assessment result		
P1	P2	P3

Potential actions

SW Crab (pots)			Potential remedial work	
P1	1.1.2.	60-80	Reference points	CEFAS Assessment should define reference points relating to B_{MSY} or equivalent proxy
	1.2.1.	60-80	Harvest Strategy	Regular review of the harvest strategy.
	1.2.2.	60-80	HCR	HCR needs to take in to account uncertainties inc. growth rates and systemic changes to recruitment
	1.2.3.	60-80	Info & Monitoring	Consider unaccounted removals, inc. beam trawl discards and recreational catch (pots and divers)
	1.2.4.	60-80	Assessment of Stock Status	CEFAS Stock assessment should be peer reviewed
P2	2.1.1.	‹60	Retained Outcome (Spider)	Determine spidercrab bycatch levels in fishery. If ‹5% score could be revised upwards. If ›5% and so considered a main bycatch species, measures are introduced to reduce spidercrab bycatch and mortality.
	2.1.2.	60-80	Retained Mgmt (Spider)	Establish spider crab is not retained (or See section 7.1.3 on spider crab management)
	2.3.1.	60-80	ETP Outcome	Establish status of ETP species defined in 2.3.2
	2.3.2.	60-80	ETP Mgmt	Determine ETP species list for area
	2.3.3.	60-80	ETP Info	Establish fishery interactions with ETP species
	2.4.3.	60-80	Habitat Info	Need records of U10m interactions around vulnerable habitats i.e. iVMS.
P3	3.1.2.	60-80	Mgmt Roles	Further definition of Mgmt of stocks needed in MOU between MMO and IFCAs
	3.1.4.	60-80	Incentives	Investigate whether positive incentives can be introduced in the fishery.
	3.2.1.	60-80	Objectives	Within a management plan set short and long term objectives
	3.2.2.	60-80	Decision making process	Fully define management and processes in a management plan including consultative processes.
	3.2.3.	60-80	Compliance & Enforcement	As fishery likely to be low risk, incentivise self-regulation in the fishery and system of cross-checks.
	2.2.5.	60-80	Monitoring & Evaluation	Management plan to specify a programme of monitoring and evaluation

7.1.2. South West Lobster - pots

Summary results

Pre-assessment result		
P1	P2	P3

Potential actions

SW Pot			Potential remedial work	
P1	1.2.1	‹60	Harvest Strategy	Regular review of the harvest strategy needed.
	1.2.2.	‹60	HCR	HCR needs to take in to account uncertainties inc. growth rates and systemic changes to recruitment. SEE APPENDIX 4 FOR MORE DETAILS
	1.2.3.	60-80	Info & Monitoring	Consider unaccounted removals, inc. beam trawl discards and recreational catch (pots and divers)
	1.2.4.	60-80	Assessment of Stock Status	CEFAS Stock assessment should be peer reviewed
P2	2.1.1.	‹60	Retained Outcome (Spider)	Determine spidercrab bycatch levels in fishery. If ‹5% score could be revised upwards. If ›5% and so considered a main bycatch species, measures are introduced to reduce spidercrab bycatch and mortality.
	2.1.2.	60-80	Retained Mgmt (Spider)	Establish spider crab it is not retained (or See section 7.1.3 on spidercrab management)
	2.3.1.	60-80	ETP Outcome	Establish status of ETP species defined in 2.3.2
	2.3.2.	60-80	ETP Mgmt	Determine ETP species list for area
	2.3.3.	60-80	ETP Info	Establish fishery interactions with ETP species
	2.4.3.	60-80	Habitat Info	Need records of U10m interactions around vulnerable habitats i.e. iVMS.
P3	3.1.2.	60-80	Mgmt Roles	Further definition of Mgmt of stocks needed in MOU between MMO and IFCAs
	3.1.4.	60-80	Incentives	Investigate whether positive incentives can be introduced in the fishery.
	3.2.1.	60-80	Objectives	Within a management plan set short and long term objectives
	3.2.2.	60-80	Decision making process	Fully define management and processes in a management plan including consultative processes.
	3.2.3.	60-80	Compliance & Enforcement	As fishery likely to be low risk, incentivise self-regulation in the fishery and system of cross-checks.
	2.2.5.	60-80	Monitoring & Evaluation	Management plan to specify a programme of monitoring and evaluation

7.1.3. South West Spider Crab – nets*

Summary results

Pre-assessment result Gillnet*		
P1	P2	P3

*The pot fishery targeting spider crab was not included in the assessment exercise, but this could be included in a certification. The potential actions described below would be the same if the pot fishery were included.

Potential actions

SW Pot			Potential remedial work	
P1	1.1.1	<60	Stock Status	Research into probable extent of stock to define appropriate management unit.
	1.2.1.	<60	Harvest Strategy	Need to develop a harvest strategy (currently an MLS)
	1.2.2.	<60	HCR	HCR needed that takes account of uncertainties.
	1.2.4.	<60	Info/Monitoring	Discards and unaccounted removals need to be considered inc. bycatch & recreational catch (pots and divers)
P2	2.2.1.	60-80	Bycatch Status	Confirm by-catch species (or lack of)
	2.2.2.	60-80	Bycatch Mgmt	Consider management measures of any bycatch species id. In 2.2.1
	2.3.1.	60-80	ETP Status	Establish status of ETP species defined in 2.3.2
	2.3.2.	60-80	ETP Mgmt	Determine ETP species list for area
	2.3.3.	60-80	ETP Info	Establish fishery interactions with ETP species
P3	3.1.2.	60-80	Mgmt Roles	Define management roles within a management plan.
	3.1.4.	60-80	Incentives	Investigate whether positive incentives can be introduced in the fishery.
	3.2.1.	60-80	Objectives	Within a management plan set short and long term objectives
	3.2.2.	60-80	Decision making process	Define how management plan is developed and reviewed in a consultative process.
	3.2.3.	60-80	Compliance & Enforcement	As fishery likely to be low risk, incentivise self-regulation in the fishery and system of cross-checks.
	3.2.4.	<60	Research Plan	Develop a research plan addressing the management needs identified above.
	3.2.5.	<60	Monitoring & Evaluation	Management plan to specify a programme of monitoring and evaluation

7.2. Potential timeline for development of management

Below we set out a theoretical timeline for sequential steps taken toward implementing adaptive stock management. This is set in a single fishery example so would need to be adapted where multiple fisheries are moving through the process at the same time. This timeline could be either shortened or lengthened depending on available capacity, however the process should not be unduly rushed and time should be allowed for proper consultation, testing and establishing in law.

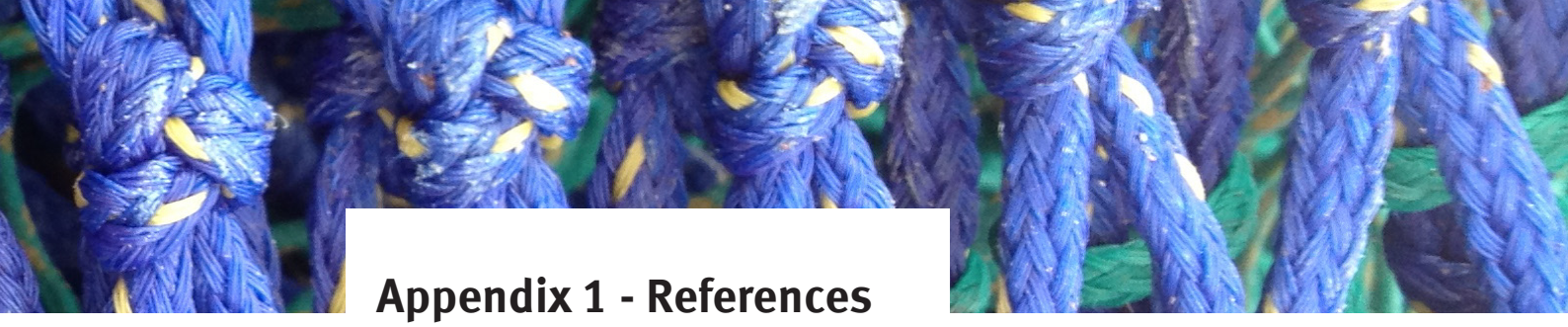
Table 7:

Potential timeline for development of local adaptive stock management.

Stage	1	2	3	4	5	6	7	8
Identify stocks to be locally managed & develop supporting rationale for local stock management unit	X							
Identify stakeholders and establish initial fishery 'Working Group'	X							
Collate and review available stock & time series data	X							
Define fishery objectives, decision-making processes, consultation mechanisms and communication methods.	X							
Undertake initial empirical assessments of available data and if possible make initial HCR and reference point proposals.	X	X						
Define the on-going stock monitoring data requirements and determine how management will meet these.		X						
Define management measures and restrictions – review existing byelaws and identify where additional measures required (in particular to allow adaptive exploitation rates)		X						

Define capacity and funding requirements		X						
Determine on-going scientific costs and capacity needs and how these will be met.		X						
Where required draw up additional MoUs with other fisheries sector bodies to clarify roles & responsibilities		X	X					
Draft Fisheries Management Plan. And comment process of ensuring binding requirements codified as byelaws.		X	X					
Consult of proposed stock management process and seek stakeholder 'buy-in' for management decisions.		X	X					
Commence operation of fishery under the terms of the Management Plan, with exploitation levels determined by reference to harvest control rule.			X					
Undertake on-going monitoring of stock status and application of HCR.			X	X	X	X	X	X
Undertake periodic evaluation & testing of stock assessment and harvest control rules				X				X
Undertake holistic evaluation of overall performance of the fishery management system.								X
Begin MSC assessment process (if required)			X	X				

Stage 1-3	Proposed FIP Stage
Stage 3-4	Potential MSC Assessment Stage
Stage 3-8	Routine Evaluation of Fishery



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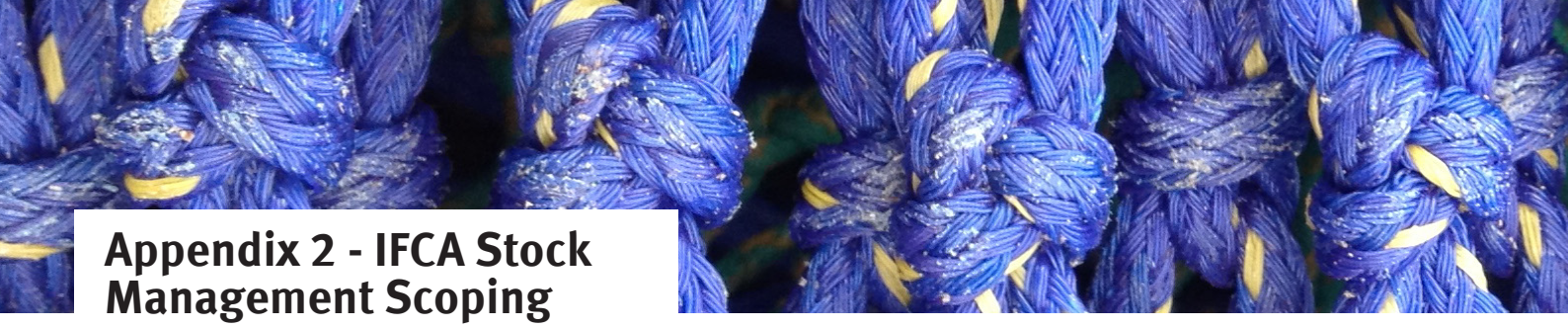


Appendix 2 - IFCA Stock Management Scoping

Row Labels	Vol t	Value £	Mgt inf	IFCA geog	Socio-economic	Sum	Rank
Scallops	877	£1,334,397	2	2	3	7	1
Lobsters	119	£1,195,706	2	2	3	7	2
Spider Crabs	341	£413,424	2	2	3	7	3
Crabs (C.P.Mixed Sexes)	1,621	£1,999,969	2	1	3	6	4
Bass	63	£543,956	2	1	3	6	5
Pilchards	1,382	£351,938	2	1	3	6	6
Cuttlefish	335	£744,272	2	1	2	5	7
Squid	72	£365,683	2	1	2	5	8
Lemon Sole	628	£2,476,210	1	1	2	4	9
Pollack	469	£904,122	1	1	2	4	10
Mackerel	774	£848,903	1	1	2	4	11
Turbot	55	£451,614	1	1	2	4	12
John Dory	61	£360,292	1	1	2	4	13
Sole	34	£358,455	1	1	2	4	14
Cod	95	£199,313	1	1	2	4	15
Brill	25	£162,008	1	1	2	4	16
Red Mullet	19	£161,878	1	1	2	4	17
Monks or Anglers	518	£1,468,334	1	1	1	3	18
Haddock	410	£513,517	1	1	1	3	19
Whiting	366	£326,156	1	1	1	3	20
Plaice	161	£242,305	1	1	1	3	21
Anchovy	254	£229,756	1	1	1	3	22
Blonde Ray	77	£150,400	1	1	1	3	23
Skates and Rays	55	£101,656	1	1	1	3	24

Appendix 3 - HCR development for lobster

To meet all requirements under Principle 1, it should be possible to develop and implement a Harvest Control Rule (HCR) framework. This determines stock status (PI 1.1.1-3), and can be built on appropriate data and assessment (PI 1.2.3-4) as well as play a central role in the harvest strategy (PI 1.2.1-2).

A generic solution to harvest control rules is presented in Appendix 3. A specific example of the strategy that might be adopted is described here for lobster. The process can be divided into four tasks:

1. Define management units
2. Define set of possible HCRs for each management unit
3. Develop stock assessment model to evaluate HCR
4. Conduct a stakeholder review to determine HCR to be implemented

The tasks above apply to all fisheries implementing HCRs, but applying the same management system to small scale fisheries (e.g. lobster) as used by large scale fisheries (e.g. North Sea autumn spawning herring) is not possible. There are insufficient financial and technical resources available to develop this sort of management, and therefore a more appropriate scale of management is required.

A more appropriate HCR for inshore fisheries would have the following attributes:

- Promote engagement with all stakeholders, particularly managers, scientists and fishers.
- Inexpensive to implement, and specifically can be administered within the financial and technical resources available to manage these fisheries.
- Makes the best use of all available information.

It is important to involve as wide a selection of stakeholders as possible in the inshore fisheries management processes. Although this is also good practice in large scale fisheries, it is almost a requirement in small scale fisheries. Apart from anything else, enforcement is made much easier if all stakeholders support the management controls that are being applied.

Generally, IFCAs have good systems to consult with stakeholders, and this should meet requirements under MSC Principle 3. For fisheries operating under regulating orders, the fishing community is fully engaged with the management process, including the stock assessment. This represents a good model to implement in other inshore fisheries. Therefore, IFCAs should seek to develop an appropriate management system that meets the same criteria as regulating orders, where regulating orders cannot be implemented. Central to the idea of engagement is to involve stakeholders in developing and agreeing an appropriate HCR.

Define Management Units

Clear management units (stocks) need to be defined. This should be based on stock biology, fishery units and jurisdiction. Adult lobster are not thought to be migratory, although larvae are pelagic and could be more widely dispersed. The best approach is likely to be to define management units based primarily on jurisdiction, but with reference to adjoining IFCAs to coordinate management. However, it is most important to set up a working hypothesis for management units. This is precautionary. Although these hypotheses might be challenged, the onus should be disproving this hypothesis (that these units can be managed under the current system) rather than changing management units based on the balance of scientific evidence alone, which does not address management needs.

Although many issues might be resolved by extending the IFCA jurisdiction from 6 to 12 miles, it makes more sense to designate all stocks that can be managed locally as “inshore” and therefore the responsibility of the IFCA regardless of where they are caught (within or outside the 6 or 12 mile limit). Lobster should be made the responsibility of the relevant IFCAs.

The possible effect of any exchange with other stocks can be tested as part of the HCR evaluation.

This can be done either as a sophisticated migration model, or running separate stock assessments with catches split or combined depending on the stock area, for example. It is likely that, as long as HCRs are harmonised across IFCAs, the harvest strategy is likely to be robust across a range of hypothetical management units.

Define the Set of Possible HCRs

Once a management unit is defined, possible HCRs can be developed. HCRs should be determined by the available data, effective management controls, costs of implementation and the need for stakeholder engagement.

Alternative indicators could be based on subsets of data (e.g. discards for a recruitment index) or different measures (e.g. mean size by sex). Several indicators could be used (e.g. a traffic lights system), but in this case the HCR might begin to become too complex, and stakeholder engagement will be lost. Alternative controls could include variable closed areas or closed seasons, alterations in the MLS and so on. Criteria for the controls are that it should be possible to adjust them at short notice and it should be possible to evaluate their effect. Controls should be divided between those used to achieve the target (i.e. permanent controls that are not adjusted) and those used to bring about a stock recovery (i.e. temporary controls that can be used to reduce fishing mortality over a few years). Of course, recovery controls may also be applied as a target control, but there should be an ability to further restrict fishing when necessary.

Possible indicators can be developed from compiling the available data and considering relationships that might exist between the reproductive potential of the stock and the indicators (Table 14). Effective controls can be identified from considering enforcement issues, likely compliance and whether the control will have the desired effect (i.e. reduce to sustainable levels catches).

In developing HCR, the likely stakeholder will need to be considered. Identifying the set of possible HCR will depend upon the available data and management resources, so engagement in early stages is not necessary, but will need to be considered. Engagement with stakeholders is promoted by:

- Using simple rules that are easy to understand and interpret, particularly so that stakeholders can understand the implications of different outcomes.
- Addressing uncertainties openly. What is not known is equally important to what is known and all management decisions must be taken under risk. By focusing on the decision-making rather than the science, management actions can be rational, timely and precautionary.
- Responding clearly and openly to constructive criticism and review from stakeholders. This is related to dealing with uncertainty. Stakeholders need to agree what is known, and address what is not known by precautionary decision-making and research. Developing a common knowledge base through better communication and using empiricism as the basis for solving disagreements will allow management to progress.

Indicators	**Positive**	**Negative**
Catch-per-pot	Related to abundance Can be adjusted by selecting data for particular measures, such as only mature females or discarded undersize.	Catch-per-pot may suffer from hyperstability as an abundance index.
Mean size	Easy to measure	Not necessarily routine reported. Affected and invalidated by changes in selectivity
Target Controls	**Positive**	**Negative**
Pot escape hatches	Easily enforced	Changes gear selectivity which needs to be estimated.

Table 14:

Some possible indicators and controls for use with lobster fisheries

Minimum landings size	Can be enforced at landing. Most discarded lobsters should survive.	Some damage possible, so unknown discard mortality.
Prohibition on landing berried females	Can be enforced at landing. Most discarded lobsters and eggs should survive.	Some damage possible, so unknown discard mortality.
Closed areas	May be used to protect vulnerable stock components and habitat	Evaluating the quantitative effect of closed areas is difficult
Recovery Controls	**Positive**	**Negative**
Pot limits	Direct control on fishing effort and maximising socio-economic potential of the fishery	Additional management and legislative tools may be needed to implement control Reaching an agreement on how pots are shared out may be difficult
Seasonal closure	Easy to enforce	Socio-economic implications are uncertain Fine adjustments are not possible because fisher response to closed seasons is not certain.

A simple proposal for a harvest control rule for lobster would be a stock size indicator as the mean catch-per-pot (numbers or weight per pot hauled) and the control would be the number of pots set. Pots hauled and the lobster catch are reported routinely, so the indicator is easy to calculate. However, it is not clear whether the number of pots can be controlled or how this might be enforced. Clearly this rule would have to apply to all pots catching lobster whether set inside or outside the 6 mile limit.

Therefore, there are a set of possible indicators that can be proposed based on the available data and a set of possible controls that can be applied based on likely compliance, effectiveness in limiting fishing mortality and cost. Reasonable combinations of indicators and controls are likely to define the set of HCR that might work. This leaves the choice of which particular indicators and controls might be applied, and the conditions when a reduction in fishing mortality might be required, how this might be achieved and by how much.

If MSY reference point is available from a stock assessment, reasonable and precautionary choices can be proposed for other reference points (Table 15). Other default and precautionary options can be proposed for HCRs to undergo testing. Clearly, these can be adjusted based on the stakeholder review and other information received during the review process. The main objective would be to get a management control in place, rather than a perfect HCR which will never need adjustment.

Some default options that might be used for configuring a HCR where other information, such as a stock recruit relationship, are unavailable. Default precautionary values can be drawn from MSC guidance, which is based on international “best practice”.

Table 15:

Default options for HCR development

Configuration	Options
Target Reference Point	All default reference points and HCRs depend upon some estimate of MSY. MSY or a proxy can be estimated from stock assessment. An MSY proxy target often can be proposed, but needs to be justified.
Limit Reference Point	Without a stock-recruitment relationship, this can be set as equivalent to 50% SSB of the target.
Indicator calculation	The indicator variable should be smoothed to reduce noise. Simple smoothers can be used which are easy to understand (e.g. moving average). The amount of smoothing might be estimated from simulations, but results are likely to be robust to this.

Trigger placement	A reasonable choice is at the mid-point between target and limit, or based on an estimate of the residual noise in the indicator after smoothing. This can be tested by simulation, but results are likely to be robust to this. Note however, that a certified fishery may be considered as "rebuilding" by the certification body if the stock is below the trigger point. Therefore, it may be useful to declare an alternative "special measures" rebuilding point below this trigger but still well above the limit, to avoid unnecessary certification costs.
Type of control	For small scale fisheries, controls on fish effort (e.g. days at sea, # traps) are desirable as they reduce the impact of fishing on all components of the ecosystem, reduce fishing costs and are more robust to error and natural fluctuations in stock size. Catch (e.g. kg landed) quotas work well where catches can be well measured and controlled and either the indicators are accurate in assessing stock status or catches can be set very low relative to the stock productivity (i.e. very precautionary). Non-static area closures are not recommended because, apart from any practical enforcement issues, they are difficult to evaluate and the effect is difficult to predict. Seasonal closures are valuable in that they will restrict fishing effort, although their impact will be less precise than managing effort directly.
Minimum effort below limit	If the stock should be reduced below the limit reference point, fishing should be reduced as low as possible. The minimum catch or effort at this point should be determined. With recreational fisheries, other fisheries outside the management control, and a need to continue to collect stock monitoring information, this catch may not be reduced to zero. Under these circumstances, it will need to be verified that the stock can still rebuild.

Develop Stock Assessment Model to Evaluate HCR

HCRs should be designed or selected by stakeholders. In order to make good decisions on HCRs, stakeholders must be given relevant information on the stock and fishery and the impact the HCR is likely to have. This is best carried out using agreed data sets with mathematical models describing what is known about the fishery to estimate how the stock will respond to different HCRs under different scenarios (Table 15).

Scientific advice for small scale fisheries is less about definitive science, although that has a role, than about trying to make the best decisions you can with the available information. Therefore measures and appreciation of uncertainty has to be incorporated into the scientific advice. Although including uncertainty in advice may make advice more difficult for stakeholders to understand, it is necessary that risks are understood for good decision-making.

Part of statuary responsibility for IFCAs is to take account of the socio-economic impact of management decisions. Economic issues can be reported on as part of the risk assessment of this sort of modelling. Although previous assessments have produced precautionary advice (CEFAS 2011), it is difficult to adapt them to account for stakeholder concerns, or address socio-economic impact from the decisions. This may explain the lack of management response to this stock assessment. A more decision based approach would allow the assessment to consider not only the "best estimate", but also the impact errors will have on outcomes, so that decisions can be adjusted accordingly. Furthermore, if the CEFAS assessment is correct, it is likely that overall yields as well as catch rates will increase with reduction in fishing effort. Management action requires that the industry believes this assessment result, and understands the socio-economic benefits for taking appropriate action. Once this is the case, the required trap reduction would be much easier to implement.

The model must be consistent with the available data and the model structure must explain the known biology and fishery relationships. This suggests that model development is best served by implementing it from the beginning in a flexible framework so that on-going investment in the

development is possible.

Because the model is essentially a model of the data, the data available will have a considerable influence on the model structure. Not all data need necessarily be available for all fisheries, but some core data are likely required to fit any model. This primary data are likely to include catch, effort and size/sex composition.

It will also be worthwhile considering how to share information across stocks. For example, stocks with tagging information might be able to estimate growth, which could improve assessments for those stocks where growth cannot be estimated.

Table 16:

Components in developing procedures to evaluate HCR

Databases	Used to organise data as well as protect confidentiality and data integrity Queries will automatically produce the most up-to-date data set rapidly and consistently Queries can be embedded in other software Open source databases (PostgreSQL, SQLite, MySQL) should be appropriate, and generally all work through essentially the same Standard Query Language.
Spreadsheet	Queries can be embedded into spreadsheets, so updates can, to a large extent, be automated. Spreadsheets are useful to hold data for public review in a widely readable form Data can be combined from several sources, so all data components are in one file Simple graphs and models can be set up to check data Data can be formatted automatically on output to a text file for analysis
ADMB model	ADMB is available for Linux and Windows, and is open source, is very fast and is able to fit hundreds of model parameters. (see www.admb.org) Data are read in as custom text file. Model is in C source code and is compiled, so some knowledge of computer programming is required as well as knowledge of mathematical modelling. MCMC can map probabilities (MCMC) for use in evaluating HCRs through simulation. ADMB is very flexible and a useful repository for research outputs.
R output	R is freeware powerful tool for producing high quality graphics as well as allowing further statistical analyses and diagnostics (on MCMC output for example). R can read text and binary files output from the ADMB model. R code can be used to produce standard output formatted for presentation and for documents.

Recently there has been a lot of interest in “data poor” fisheries stock assessment (e.g. Honey et al 2010, Pilling et al 2008, ICES 2012b). Various techniques have been proposed and have their uses. Many try to emulate standard estimation methods applied to fisheries that are not data poor, and most try to simplify calculation methods. This can result in such methods ignoring data which cannot be used, which is not satisfactory particularly in data poor situations, and having strict assumptions which reduce credibility in the results.

Many inshore fisheries, such as lobster, have significant data sets (Table 17). Others, which are of less interest, such as periwinkles, are genuinely data deficient. Nevertheless, data are usually limited in nature. Crustacean fisheries do not have age data, but rely on size which is an imperfect indicator of age. Furthermore, many crustaceans and other shellfish have life history characteristics, which make applying many standard stock assessment approaches inaccurate. Very simple methods do not necessarily measure uncertainty (they concentrate on robustness instead), and may be very restrictive and inflexible, discouraging engagement.

Using HCRs allows the use of methods which focus on the decision-making and management advice rather than attempting to estimate stock status exactly. This is consistent with the modern definition of MSY which takes into account risk. A general methodology already exists in decision theory to deal with data poor situations, and these methods are much more flexible and should make the best use of all available information.

Primary data, which is required and secondary data, which is desirable, for use in fitting the stock assessment model. Secondary data may not be absolutely necessary, but would be valuable where they are available.

Table 17:

Data requirements for lobster HCR development

Primary Data Component	**Comments**
Total annual catches	All catches (discards and landings) are required for as long a time period as possible. Specifically, the catch time series should extend back to the start of the fishery, so that reference points are estimated relative to the unexploited state. The model should be able to use annual data if monthly data are not available in the early part of the time series. Although the model should be robust to missing data, total annual catches are required for all years in the model.
Total catches by month	As much of the catch data as possible should be aggregated by month. Total catches do not need to be divided by fleet, size or sex (see size grading below), but should cover all catches, including recreational. Because the model fits to catches, if they are estimated, some sort of measurement error can also be provided.
Size and sex sampling	Any sampling of the landings should be aggregated by month, fleet (i.e. with separate selectivity).
Landings, discards and effort	The main abundance index, in the absence of a fishery independent survey, will depend on catch and effort data. This can be based on observations for each month and fleet, but need not be complete.
Secondary Data Component	
Tagging	Any tagging data will be useful for estimating growth and mortality. Outside the model, it may also be used to help define management units.
Size Grading	If landings are sorted into commercial size grades, these landings by size grade can be used as long as the grading is accurate and well-defined.

The current “best practice” in stock assessment is to use statistical dynamic age structured models, which can be made relatively flexible to represent local data and stock biology. The model links what is known about the biology to the available observations (Table 18). These models tend to be complex and have been difficult to fit to data, but new software and methods have addressed this to some degree. It is now possible not only to fit such models to data, but “map” the uncertainty of the fit, all on a standard desktop computer. Software to do this is free. The main problems are likely to be the potential complexity, skills required to develop and maintain such a model and agreement over what is included or excluded in the model.

The stock assessment model should consist of the population model, which tries to capture the most important attributes of the life history and biology, and the likelihood functions which link the population model to the data. A simple but reasonably complete version of the model should be developed for stakeholder review. In particular, it should be possible to assemble the available data and build appropriate likelihood functions for the data. Stakeholder review is most likely to lead to changes in model structure, for example requiring that some fleets may be separated or combined based on assumed differences in selectivity.

Table 18:

Attributes that the stock assessment model is likely to need

Structure	**Comments**
Unit stocks	A working hypothesis of unit stocks is required. This will determine how data that the model is fitted to are divided up or combined. It may be possible to get some insight into appropriate stock definitions from fitting the model.

Monthly time step	Although seasonality makes modelling more complicated, using a month time step enables the software to use seasonal patterns to fit the model which with an annual time step would not be available.
Separate population models for each sex	The males and females grow differently, so the model should be sex differentiated.
Seasonal growth	The growth model is critical in crustaceans as it is used to convert from age to size. It will need to be resolved whether an explicit model of moulting is required.
Missing data	The model will not tolerate (or it would make the analysis much more difficult) missing catch data. Otherwise the model will need to be able to handle missing data and even some missing components where they are not available.
Code Design	In designing the model, some account should be taken of robustness, future development and accessibility. Design of the software should follow good programming practice and be well-documented. Functions should be organised so that they meet requirements for efficient calculation if the "random effects" module is used (i.e. define Separable Functions). It is quite likely that at some point in the future the recruitment will be best estimated as a "random effect" or that the model could develop into a state-space model because of the uncertainties over growth. The model should be made freely available. This will help check and improve the model without additional investment.
Other requirements	Input estimates (as probability priors or point values) of various parameters will be required. In many cases it is easier to fit sub-models outside the made model frame and provide estimates of parameters. This is likely to be a good approach for natural mortality, sex ratios, the maturity ogive, standardising effort and the growth models, at least in the first instance. The assessment should focus initially on estimating fishing mortalities, catchability, selectivity and recruitment.

ADMB is the best platform for developing a bespoke stock assessment model. This platform is technically demanding, but highly flexible and can fit stock assessment models most other approaches cannot. Data inputs and result outputs can be prepared so that they can be processed automatically to produce outputs for stakeholder review rapidly. Simple HCRs can be evaluated rapidly from Markov chain Monte Carlo (MCMC) outputs with ADMB, so the robustness of the HCR to uncertainties can be tested.

Developing a model is not a simple process, and would require some investment to get it underway. There is considerable free code available for other fisheries, so it would not be necessary to start from scratch. Model code can be adapted for the population and likelihood functions and then improved for the specific use in English lobster fisheries.

Developing the stock assessment model is a different process to evaluating the HCR, and these tasks should be separated. Evaluating the HCR should be done as part of the stakeholder review, whereas the stock assessment model can be developed and fitted by a smaller group of scientists and interested stakeholders. This is because developing and fitting the model is technical and difficult and will take considerable time. Once a satisfactory model has been fitted making the best use of the available data and what is known about the stock, it can be used to evaluate the HCR.

Fitting the assessment model is not trivial. There is a too step process. Firstly, the "maximum posterior" point estimates are estimated. Over-parameterised models may not fit, and therefore it may not be possible to include some model structures even if stakeholders believe they are important (i.e. data is insufficient to support the desired model). Secondly, once a reasonable configuration for the model is found, and it fits the data, the Markov chain Monte Carlo (MCMC) simulation can be used to map the uncertainty. MCMC again can be difficult to apply, can take considerable time to run, and diagnostic evidence is required that it has worked. However, once it has been successful, the outputs can be used to evaluate the HCR very rapidly.

It would be best to start with as simple a model as possible, so that the review process might produce some increase in complexity but avoid the complexity becoming overwhelming. Fit diagnostics may identify changes in the model as well as further research that might be required.

The stock assessment model can also be a focus of research. It is highly likely that the model will identify important uncertainties which can be addressed by further data collection and research. The results from these activities can be included in the model, reducing uncertainty and changing scientific advice. Such research is more likely to have a significant impact on fishery management.

Conduct a Stakeholder Review

Stakeholder review is important to promote engagement in the management process, ensure that the model and HCR has no errors and to provide evidence that the HCR is likely to achieve management objectives. More generally, reviews are an important way to resolve scientific issues, plan progress and provide evidence that advice is credible. Reviews can be internal or external. Internal reviews are valuable, particularly where the issues are not contentious, but can often be challenge on the basis that the review is not fully independent. Where independence is necessary to resolve an issue, external review is better, but more expensive. Using IFCA staff to review each other's management could be a cost effective way not only to provide independent review, but ensure IFCAs are aware of what each one is doing.

Stakeholder review is likely to require one or more meetings to evaluate the stock assessment and decide on an appropriate robust harvest control rule. Technical review of the model should probably be carried out separately by scientist stakeholders, but any review should be kept as open as possible so that any stakeholder who wishes to attend can do so.

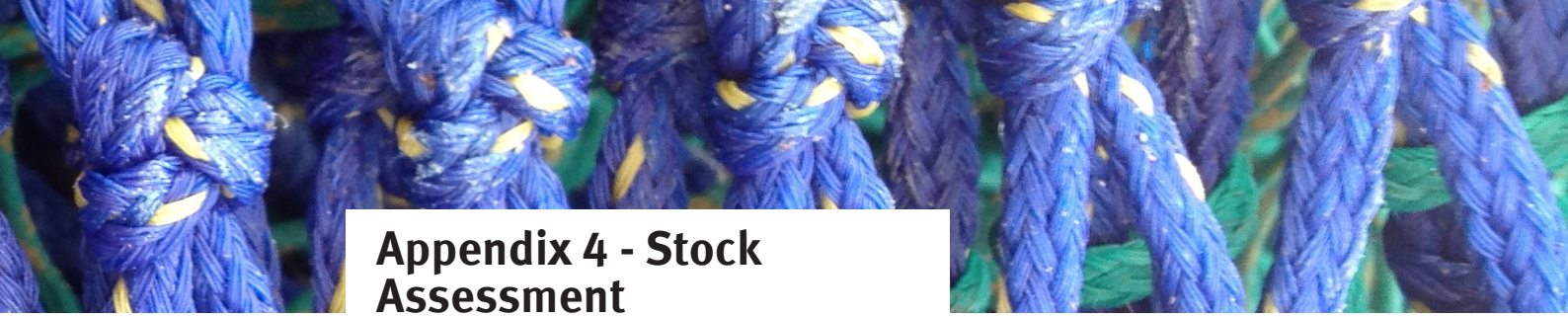
The review should ultimately aim to produce a single "current" assessment model and a HCR to implement which can be evaluated by the model and is demonstrated precautionary and appropriate for the fishery (e.g. is consistent with MSY). The review should also recommend research which can be used to update and improve the model in the longer term. Any meeting should have terms of reference to make their tasks clear.

Further independent review by external experts (e.g. from EU, USA or further afield) can be conducted if necessary. While desirable, this can be expensive, but should produce definitive evidence whether the HCR is appropriate and is likely to meet harvest strategy objectives.

The review process should constructive and inclusive. Stakeholders can be encouraged to suggest alternative models and data, which should if possible to included and tested in the current model. However, it should not be possible to reject a model without proposing some alternative in its place, as this can be counter-productive.

An important challenge is to ensure outputs from the stock assessment and HCR evaluation is in forms that all stakeholders can understand and assimilate. This communication of technical and scientific information may require some development, both in identify types of output that stakeholders can understand as well as teaching them how interpret types of output. A lack of understanding science is one of the most reasons for distrust and ignoring this source of information.

Once the HCR has been accepted and evidence provided that it should work, further frequent assessments are not necessary. It would be good practice to monitor the HCR to ensure that it is functioning as expected and to evaluate the performance of the HCR infrequently so that it might be improved. Operating the HCR for between 5-10 years between assessments may well be sufficient, although some resources might be reserved for special evaluations should the need arise.



Appendix 4 - Stock Assessment

Stock assessment involves modelling of empirical data to examine the status of fish stocks and to provide advice on future catches; essentially how many fish are there, how many were there and how many are likely to remain if certain catches are taken. This is a specialist task which can involve significant data and highly technical mathematical modelling. Resources are unlikely to be available for regular stock assessments of small scale fisheries, but a stock assessment can be a useful tool for designing and simulation testing a harvest control rule.

Stock assessment of shellfish stocks is generally poorly developed in Europe. There are few standardised approaches and data supports are weak in many cases. The majority of species are not included in the EU Data Collection Framework (DCF).

The approach to stocks assessment should take account of the fishery, species biology, life history and data that are available. The stock assessment model will attempt to explain the data based on what is known of the fishery and biology of the stock. Where data are limited, several competing models may provide equally good explanations for observations. However, as long as the harvest control rule can be shown to achieve desirable results regardless of which model may be right, it can be shown to be robust to uncertainty and suitable for the fishery.

Some examples of off-the-shelf assessment models are provided in Table 19. Their complexity and data requirements vary. All software is freely available on the NOAA web site. In many cases, however, bespoke models may be more appropriate, making better use of the available data. In any case, careful interpretation of assessment results will be required and models will need to be tested to ensure that the fit is valid.

Other useful sources, including spreadsheet downloads (http://www.utas.edu.au/docs/tafi/TAFIHomepage.html), that allow non-modellers to implement various assessments and estimate model parameters are provided by Haddon (2001)

Fisat II (http://www.fao.org/fishery/topic/16072/en) is a program package developed mainly for the analysis of length-frequency data, but also enables related analyses, of size-at-age, catch-at-age, selection and other analyses

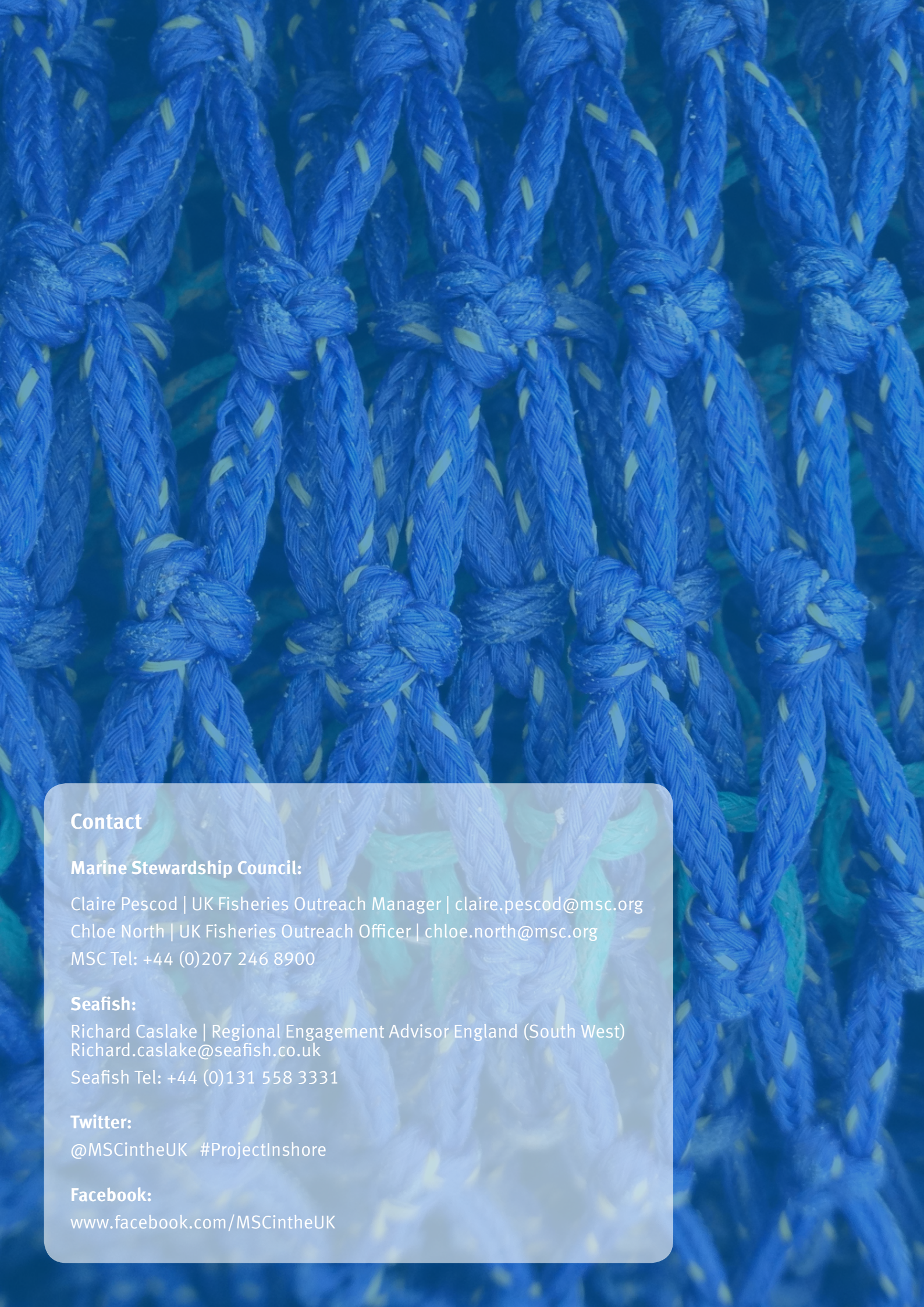
ICES provide frequent stock assessment training workshops

Table 19:

Examples of stock assessment models, relative complexity & data requirements[4]

Feature	Model											
Model Complexity	1	1	1	1	1	2	2	3	3	3	3	4
Data / Observation Error	DCAC	SEINE	AIM	ASPICE	CSA	SCALE	VPA	VPA2BOX	AMAK	STATCAM	ASAP	SS3
Total catch (landings+discards)	X		X	X	X	X		X	X	X	X	X
Catch at age (CAA)							X	X	X	X	X	X
Catch at length (CAL)						X						X
Address variation in CAA or CAL		X							X	X	X	X
Age specific indices of abundance for tuning							X	X	X	X	X	X
Age-aggregated tuning indices			X	X	X	X	X	X	X	X	X	X
Tag-recapture								X				X
Process / Model Specification	DCAC	SEINE	AIM	ASPICE	CSA	SCALE	VPA	VPA2BOX	AMAK	STATCAM	ASAP	SS3
Stcok recruitment function									X		X	X
Sexual dimorphism in growth rates						X		X				X
Spatial heterogeneity								X				X
Incorporate long term historical landings	X			X		X			X	X	X	X
Handle gaps in age or length information		X				X			X	X	X	X
Multiple fleets									X	X	X	X
Handle differences between sexes						X		X				X
Automatic retrospective analyses			X	X			X			X	X	
Independently est. temporal changes in catchability for surveys									X		X	X
Address variations in bioligical sampling intensity over time									X	X	X	X
Consider measurement error for individual time series observations									X		X	X
Uncertainty / Forecasting / BRPs	DCAC	SEINE	AIM	ASPICE	CSA	SCALE	VPA	VPA2BOX	AMAK	STATCAM	ASAP	SS3
MCMC									X	X	X	X
Bootstrap			X	X	X		X	X				X
Estimation of BRP for F			X	X					X	X	X	X
Estimation of BRP for SSB				X					X	X	X	X
Linkage to external/internal forecasting program			X	X			X				X	X

[4] From http://nft.nefsc.noaa.gov/ Models can be downloaded from the NOAA website. The models are all implemented in the NMFS stock assessment tool box.



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