MACALISTER ELLIOTT AND PARTNERS LTD.

NORTH MENAI STRAIT MUSSEL (*MYTILUS EDULIS*) FISHERY (Certificate MEP-F-002)

PUBLIC CERTIFICATION REPORT

for Unit of Certification extension to include River Dee as seed collection site

APRIL 2012

MacAlister Elliott and Partners Ltd
56 High Street, Lymington
Hampshire SO41 9AH
United Kingdom
Tel: 01590 679016
Fax: 01590 671573
E-mail: mep@macalister-elliott.com
Website: www.macalister-elliott.com

SUMMARY INFORMATION

Fishery Name	North Menai Strait mussel fishery
Previous Unit of Certification	Mussels from bottom culture (wild caught seed) from the northern Menai Strait, Wales, UK, grown by members of the Bangor Mussel Producers Ltd. (BMP Ltd.) with seed fished by mussel dredge from i) Morecambe Bay or ii) Caernarfon Bay.
Proposed Extended Unit of Certification (see details below)	As above, but also including seed fished from the estuary of the River Dee (Cheshire / N. Wales).
Species	European / blue mussel *Mytilus edulis*
Area	Seed fishery area: Current – Morecambe Bay, Caernarfon Bay; Proposed – River Dee (Cheshire / N. Wales) Mussel culture area: Menai Strait, north of the Swellies.
Method of capture	Mussel dredge
Client Address	Bangor Mussel Producers Ltd. - Myti Mussels Ltd., Extramussel Ltd., Ogwen Mussel Ltd and Deep Dock Ltd. c/o Deepdock Ltd Bwthyn-y-mor, Llanfaethlu Holyhead, Anglesey, LL65 4HD Phone/Fax: 01407 730075 mussels@deepdockltd.co.uk
Client Contact Name	James Wilson (Deep Dock Ltd.)
Client Telephone No.:	+44 (0)1407 730075
Client Email	mussels@deepdockltd.co.uk
Certificate number	MEP-F-002
Certificate Issue Date	26 October 2010
Certificate Expiry Date	25 October 2015
Assessment team for extension of UoC	Expert 1 (Team Leader): Dr Jo Gascoigne, Expert 2: Dr Andrew Brand
Site Visit Date	26-27 October 2011
Preliminary Conclusion	**The River Dee can be added to the UoC for this fishery**.

REPORT SUMMARY

BMP Ltd. were invited to remove some mussels from cockle beds in the River Dee on a one-off basis, and requested that this site be evaluated for addition, if possible, to the UoC for the north Menai Strait mussel fishery (certified by MEP in October 2010). The Dee was assessed during a site visit in October 2011, at the same time as the first annual surveillance audit for the rest of the fishery.

The main concern relating to mussel fishing on the River Dee is the risk of translocating Chinese mitten crabs (an invasive alien species) into the Menai Strait. This issue was addressed by BMP Ltd. in discussion with the Countryside Council for Wales, based on their agreed Code of Good Practice. CCW was satisfied that the risk was sufficiently mitigated. Aside from this issue, there were no major differences between the Dee estuary and the other seed collection sites already included in the UoC (Morecambe Bay, Caernarfon Bay).

In the original assessment, two PIs scored <80 – both of these have, however, been addressed under the Year 1 Client Action Plan (see first annual surveillance audit report). No PIs scored <80 for the River Dee specifically. The preliminary certification determination is therefore that the River Dee **should** be incorporated into the UoC for this fishery.

The MEP Certification Committee met on the 26th March 2012 to consider the report, peer reviews and stakeholder comments, and concluded that the River Dee **should** be incorporated into the UoC for this fishery.

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1. INTRODUCTION

1.1. GENERAL BACKGROUND TO THE REPORT

The assessment of the north Menai Strait mussel fishery in October 2011 had two purposes. Firstly, the MEP team carried out the first annual Surveillance Report for the fishery. Secondly, the team carried out an MSC full assessment to extend the Unit of Certification (UoC) for this fishery to cover an additional location for mussel seed fishing – the River Dee estuary. This report is the Public Certification Report for the assessment for the proposed extension to the UoC. The annual surveillance report is published separately.

The fishery operates by fishing seed mussels from various sources and relaying them on 'lays' (areas leased to each company via a 'Several Order') in the Menai Strait (between Anglesey and Gwynedd, North Wales). When the fishery was assessed during 2010, mussel seed was taken only from two sources – Morecambe Bay in England, and Caernarfon Bay in Wales. These areas between them provide a more or less reliable source of seed in most years, and more importantly are not infested with any invasive species (e.g. slipper limpet *Crepidula fornicata*, Chinese mitten crab *Eriocheir sinensis* and the tunicate *Didemnum* sp.) that could be introduced to the Menai Strait with the mussels. BMP agreed a Code of Good Practice with the Countryside Council for Wales (CCW – the statutory conservation body for Wales) to take seed only from these areas.

There is a cockle fishery (*Cerastoderma edule*) in the Dee estuary which is managed by the Environment Agency. In 2009 and 2010 there was significant seed mussel settlement on dead cockle shell on the cockle beds (forming 'mussel crumble'). This is a relatively unusual occurrence in the Dee, and threatened the cockle beds with a risk of smothering in mussel 'mud'. The seed mussels in 2009 were left on the bed, but in 2010 the area of seed settlement expanded to cover South Salisbury Bank – a particularly productive cockle bed on the Welsh side of the Dee estuary – and the Environment Agency and stakeholders decided that it should be removed. They therefore contacted BMP Ltd. in early 2011 with a request to remove the seed mussels to their lays in the Menai Strait.

BMP Ltd. identified two potential problems for them in taking these mussels: i) the potential risk of translocation of Chinese mitten crabs from the Dee to the Menai Strait and ii) the fact that the River Dee was not included in the UoC for their MSC assessment. In addressing the mitten crab risk, BMP Ltd. and CCW followed the procedure set out in the Code of Good Practice (described in detail below). For assessing whether the Dee could be added into the UoC for this fishery, it was agreed that an extension to the MSC assessment would be carried out at the same time as the first annual surveillance audit in October 2011 (this report sets out the result of the assessment of the River Dee – the annual surveillance audit report is published separately). Meanwhile, seed was removed from the River Dee to the Menai Strait, but kept separated from other mussels on the lays so that if the UoC could not be added, the chain of custody could still be respected.

1.2. UNIT OF CERTIFICATION EXTENSION

BMP Ltd. is bound by a Code of Good Practice agreed with CCW, which aims to reduce as far as possible any risk of the introduction of invasive alien species into the Menai Strait along with shipments of mussels. The Code of Good Practice permits only two sites (away from the Menai Strait) from which seed mussels can be harvested: Morecambe Bay and Caernarfon Bay. These are therefore the only two seed collection sites contained in the Unit of Certification (UoC) at present.

However, in early 2011, BMP Ltd. was contacted by the Environment Agency, who manages the cockle fishery on the River Dee. There was significant settlement of mussel seed over several productive cockle beds in 2009 and 2010, and the resulting 'mussel crumble' threatened to smother the cockles and damage or eliminate the fishery for 2011. The Environment Agency requested BMP Ltd. to remove the mussel seed to the Menai Strait lays from one of the most important beds – South Salisbury Bank on the Welsh side of the Dee estuary (Figure 1).

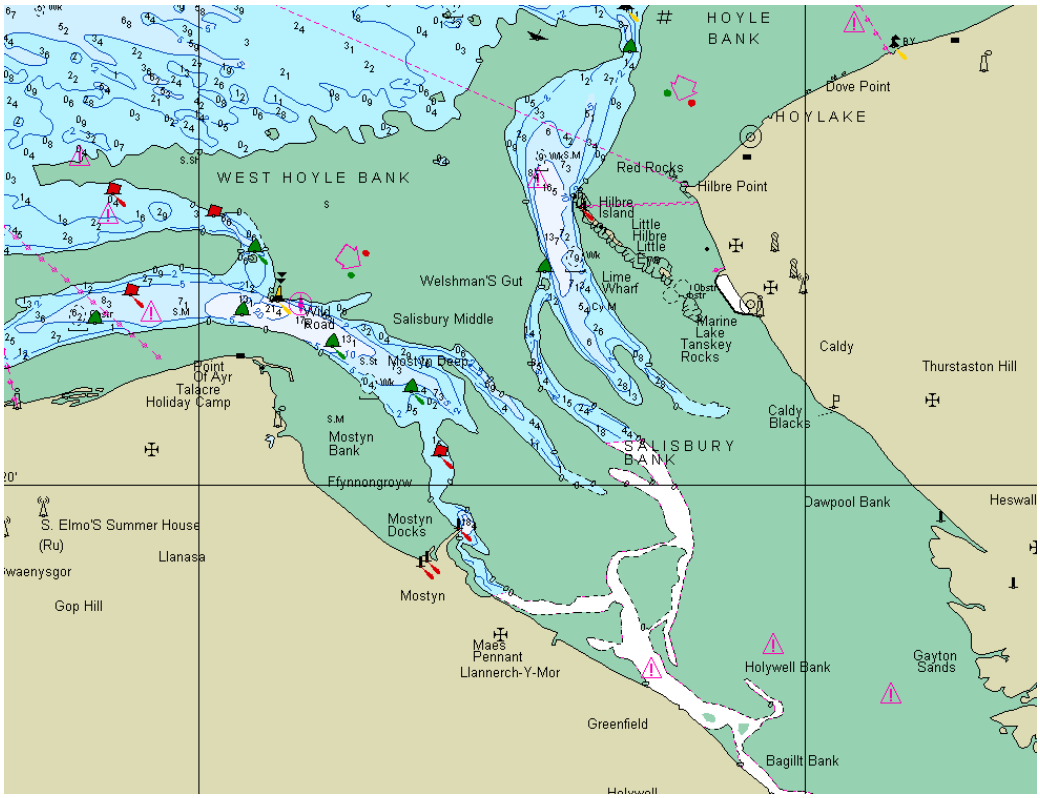


Figure 1 – Map of Dee estuary including Salisbury Bank (sourced from using C-Map software).

Figure 2 – Extract from Welsh Government licence for the fishery, showing the exact location of dredging, close to the Port of Mostyn.

BMP Ltd. contacted MEP before any seed was taken from the River Dee, to discuss how the seed could be harvested and grown within the requirements of the MSC certification of the fishery, since the River Dee is not part of the UoC. It was agreed between BMP Ltd., MEP and MSC that a 'partial full assessment' should be carried out, so that the assessment of the River Dee as a seed collection site against the MSC standard would be subject to the same level of scrutiny as the other seed collection sites originally included in the Unit of Certification (Morecambe Bay and Caernarfon Bay).

In order to achieve the objectives of the Environment Agency in relation to the cockle fishery and to minimise the risk of introducing alien species (in this case mitten crabs) to the Menai Strait, the seed had to be harvested within a relatively short time window in the summer of 2011. This window was earlier than the timeframe in which it was reasonably possible to arrange a partial assessment to cover the River Dee (given the MSC requirements for announcing team, dates and methodology, and notice periods to stakeholders). It was agreed that BMP Ltd. should go ahead and harvest the seed from the River Dee, but that they should keep it separate from other mussels on the lays until it was decided whether the River Dee met the requirements of the MSC standard, and therefore whether it could be incorporated into the UoC or not. Meanwhile, a partial full

assessment of the River Dee was organised to coincide with the first annual Surveillance Audit for this fishery (see Section 1 of this report).

For the sake of brevity, and in order to target reviews by the Peer Reviewer and by stakeholders to the appropriate new information in this assessment, full background details of the fishery and previous certification process are not given here – the reader is referred to the Public Certification Report for this fishery, available on the MSC website[1] or by request from MEP. Some background information on the River Dee estuary is given below.

1.3. ASSESSMENT TEAM AND PEER REVIEWERS

It was agreed that this assessment for an extension to the UoC could be carried out by an expert team of two (instead of MEP's usual three). Aside from the team leader, the previous team members were not available, so the second team member was a peer reviewer for the previous assessment. The team members were as follows:

Dr. Jo Gascoigne: Jo is the Director for Fisheries Certification at MEP and a former research lecturer in marine biology at Bangor University, where she researched mussel beds and their ecosystem impacts. She has been involved in several previous and on-going assessments. Jo was team leader.

Dr. Andrew Brand: Andy worked for the University of Liverpool for 40 years at Port Erin Marine Laboratory, Isle of Man, retiring in 2006 as Director. He developed large, well-funded, research programmes on the biology, ecology, aquaculture and fisheries of bivalve molluscs, and on the environmental impact of bivalve fisheries. He has also been a member of ICES Working Groups on herring, scallops and ecosystem effects of fishing. He now works as an independent shellfisheries consultant. He has acted as an assessor and as a peer reviewer for MSC assessments for scallop, mussel, clam and oyster fisheries in the Irish Sea, Faeroes, Denmark, Canada and the USA.

The peer reviewers were as follows:

Dr. Mike Kaiser: Dr. Kaiser is an internationally known expert in marine ecology-particularly the ecological impacts and management of fisheries and marine conservation. He is currently professor of marine conservation biology at Bangor University and also conducted the full MSC certification assessment of the Northern Menai Strait mussel.

Dr. Robert Blyth-Skyrme: Dr Blyth-Skyrme has 15 years working in marine fisheries. With numerous publications to his name, he has also worked for organisations such as

[1] http://www.msc.org/track-a-fishery/certified/north-east-atlantic/north-menai-strait-mussel/assessment-downloads

Natural England as Senior Marine Fisheries Specialist. He is currently based in Hawaii, where he is the President of Ichthys Marine Ecological Consulting Incorporated, USA and Managing Director of Ichthys Marine Ecological Consulting Ltd in the UK.

2. THE DEE ESTUARY ECOSYSTEM

2.1. MUSSELS IN THE DEE

Significant settlement of seed mussels in the Dee estuary is a relatively rare occurrence, and there has never been any kind of mussel fishery in the estuary on a regular basis. There was, however, some settlement in 2009, with the area covered by mussels expanding in 2010, such that it was considered to pose a threat to the cockle population. It is assumed that the seed mussel removal (fishery) that occurred in 2011 will be a one-off, or at most, only an occasional activity.

2.2. OTHER FISHERIES IN THE DEE

The cockle fishery is the most important fishery in the River Dee because of its high value. It is a seasonal (summer, spring tide) fishery with the catch variable from year to year depending on settlement. The cockle fishery interacts significantly with this mussel 'fishery' as outlined above. Aside from this, the only other fishery in the Dee estuary, apart from recreational fishing, is reported to be a small amount of trawling for shrimp (*Crangon crangon*) and netting for flounder (*Platichthys flesus*), which does not interact with the mussel or cockle fisheries.

2.3. PROTECTED SPECIES

The Dee estuary is an SPA (Special Protected Area) – a European designation that provides for the protection of all species of naturally occurring wild birds, in particular for rare or vulnerable species, and for regularly occurring migratory species. The estuary is important habitat for ducks, waders and seabirds (JNCC, 2011(a)). The species listed as important for the SPA are given in Table 1, along with an indication of their diet. Species known to feed on mussels are oystercatchers and to a lesser extent knot.

Table 1. Birds found in the Dee Estuary SPA, along with an indication of the main species in their diet. Bird species highlighted in bold consume *M.edulis* as part of their diet at various times in the year.

Scientific Name	Common Name	Diet	Diet Examples	Reference
Anas acuta	Pintail	Plants & invertebrates		Brochel *et al.*, 2011
Anas crecca	Teal	Seeds & small invertebrates		Brochel *et al.*, 2011
Calidrys	Dunlin	Insects, snails	*Nereis diversicolor,*	Worrel, 1984;

alpina alpina		& worms	*Macoma balthica, Hydrobia ulvae*	Dit Durrell, 1990
Calidrys canutus	Knot	Shellfish & worms	*Macoma balthica, Hydrobia ulvae, Mytilus edulis, Cerastoderma edule*	Prater, 1972
Haematopus ostralegus	Oyster-catcher	Mussels, cockles & worms (inland)	*Mytilus edulis, Cerastoderma edule*	Ens *et al*., 1984; Meire & Ervynch, 1986; Cayford & Goss-Custard, 1990; Le Rossignol *et al*., 2011; Gittings, 2011
Limosa lapponica	Bar-tailed Godwit	Worms, snails & insects	*Arenicola marina, Nereis diversicolor, Nephtys hombergii, Scolopos armiger, Cerastoderma edule, Carcinus maenas, Macoma balthica*	Scheiffart, 2001; Gittings, 2011
Limosa limosa islandica	Black-tailed Godwit	Insects, worms, snails, plants, beetles, grasshoppers	*Scrobicularia plana, Nereis diversicolor, Hydrobia ulvae*	Moreira, 1994
Numenius arquata	Curlew	Worms, shellfish, shrimp	*Arenicola marina, Crangon crangon, Mya arenaria, Carcinus maenas*	Ens *et al*., 1990
Pluvialis squatarola	Grey Plover	Shellfish & worms		Dit Durrell, 1990
Sterna hirundo	Common Tern	Fish	*Clupea harengus, Platichthys flesus, Solea solea, Alosa fallax, Sprattus sprattus*	Dänhardt *et al*., 2011; Perrow *et al*., 2011; Certain *et al*., 2011
Sterna sanicensis	Sandwich Tern	Fish	*Sprattus sprattus, Engraulis encrasicolus, Merlangius merlangus, Ammodytes tobianus*	Perrow *et al*., 2011; Certain *et al*., 2011
Tadorna tadorna	Shelduck	Invertebrates, small shellfish	*Corophium volutator, Nereis diversicolor,*	Olney, 1965; Cadée, 2011

		& aquatic snails	*Entermorpha* spp.; *Hydrobia ulvae*	
Tringa totanus	Redshank	Molluscs, crustaceans, insects & earthworms	*Corophium volutator*, *Macoma balthica*, *Nereis diversicolor*	Sánchez *et al*., 2005

2.4. HABITATS AND ECOSYSTEMS

The Dee estuary is composed of a wide expanse of intertidal sandbanks (Fig. 3). The tidal range and tidal currents are significant, with a tidal bore reaching up sometimes as far as Chester, and significant sediment erosion and re-deposition by tides and waves.

Figure 3. Hilbre island in the Dee estuary, looking southeast upriver and towards the Welsh coast. Inset, satellite view of the Dee and Mersey estuaries and the Wirral.

As well as being an SPA, the Dee estuary is an SAC (Special Area of Conservation) (JNCC, 2011 (b)), designated mainly for intertidal sandflat and mudflat habitats. These designations mean that activities in the estuary can be subject to an appropriate assessment, if it is considered that they have a likely significant effect on the species and habitats.

2.5. MITTEN CRABS

The Chinese mitten crab (*Eriocheir sinensis*) is one of the most damaging alien invasive species (on the 'top 100' list of worst invaders – Global Invasive Species Database (2011). It is native to north China / Siberia / Japan and was first found in Europe in the River Aller in Germany in 1912 (Gollasch, 2011) – probably arriving in ballast water. It spread rapidly around the North Sea and has been abundant in the Thames for many years, spreading from there across the UK via a combination of marine transport, crossing overland between catchments and deliberate introductions (since it has a high value on the Asian market).

Adult Chinese mitten crabs (*Eriocheir sinensis*) have a catadromous-type life history; adults migrate between fresh and salt water, with reproduction occurring in salt water (Gibey *et al.*, 2008*). E. sinensis* become sexually mature at approximately three years old (Rudnick *et al.*, 2005). It has been suggested that environmental signals cue the stimulation gonad development, which then causes their characteristic downstream migration at the end of the summer months. When they arrive in salt water they mate (Rudnick *et al*, 2005). In the River Elbe in Germany, this species of crab has been documented to travel an average of 15 km per day during the downstream migration (Herborg *et al*., 2003). Fig. 4 below shows the different stages of their lifecycle.

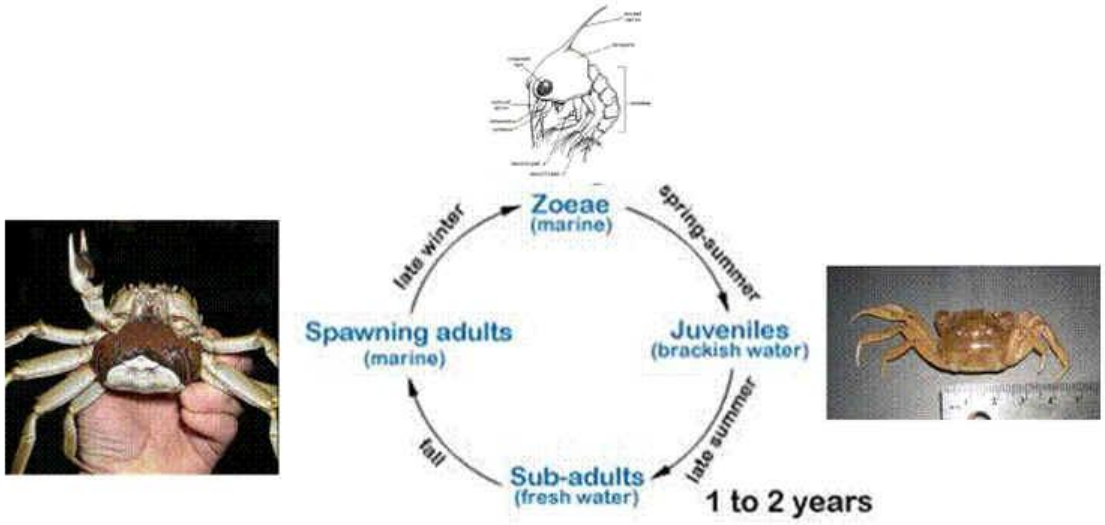


Figure 4. Chinese mitten crab (*Eriocheir sinensis*) lifecycle. Taken from the Smithsonian Environmental Research Center website, 2011[2]

2 http://www.google.co.uk/imgres?q=eriocheir+sinensis+life+cycle&um=1&hl=en&sa=N&biw=1366&bih=587&tbm=isch&tbnid=adnFYqo3mbZ4M:&imgrefurl=http://www.serc.si.edu/labs/marine_invasions/news/mitten_crab.aspx&docid=erLeIHnNj01TEM&imgurl=http://www.serc.si.edu/labs/marine_invasions/images/organisms/Mittencrab_lifecycle.jpg&w=795&h=364&ei=7OLgTuDZIYWj8QPjNTeBA&zoom=1&iact=rc&dur=58&sig=105056713265004150414&page=2&tbnh=77&tbnw=169&start=21&ndsp=24&ved=1t:429,r:22,s:21&tx=91&ty=53

Crab embryos are held by the female until ready to hatch. They are then released into the marine environment. The crab larvae undergo five planktonic zooeal life stages before settling out to the substrata (Rudnick *et al*., 2005). A study carried out by Anger (1991) showed that successful development of hatching to metamorphosis can only occur when the surrounding water temperature is equal to or greater than 12^{o}C. It was also found that with increasing temperature, both overall survival of zooeae and their tolerance to a wider range of salinities increased, in addition the duration that development takes exponentially decreased. Upon settlement, juvenile crabs migrate upstream in spring and summer. The sub-adult stage in the lifecycle is spent in brackish water until maturity. It is thought that a large population of this species in non-indigenous locations such as the River Dee or the River Thames estuaries may cause a shift in the benthic assemblage, either through direct predation or competition with native species (Gibey *et al*., 2008).

Thus adult female mitten crabs are present in the Dee estuary from ~October to May, while juveniles may be present up to ~July. This gives a time window in August and September when no life stage of mitten crabs is likely to be present in the estuary – after the juveniles have left and before the females arrive. In the most seaward part of the estuary (such as South Salisbury Bank) the 'safe' window is longest. Salinity in this area is ~26-33 psu, according to Environment Agency data[3].

3. MANAGEMENT SYSTEM IN THE DEE

3.1. ORGANISATIONS INVOLVED

The management of the Dee estuary is considerably complicated by the fact that it is shared between Wales and England. Each country has its own organisations and structures for inshore fisheries management, and for protected area management.

Inshore fisheries management in England is the responsibility of the Inshore Fisheries and Conservation Authorities (IFCAs – formerly Sea Fisheries Committees SFCs) – in this case, the relevant IFCA is the Northwest IFCA, whose remit extends from the Dee to the Solway. In Wales, inshore fisheries management is dealt with directly by the Welsh Government (WG; formerly the Welsh Assembly Government WAG). Both these systems are new and still bedding in; the Northwest IFCA was created in 2011 from the merging of Cumbria SFC and Northwest SFC, which in turn was created in 2010 from the English part of the Northwestern and North Wales SFC, while WG has only had control of inshore fisheries in Wales since April 2010. The exception to these structures is in fact the cockle fishery in the Dee, which for historical reasons is managed by the Environment Agency – who cover both jurisdictions Thus the cockle fishery, which was driving the removal of seed mussels from South Salisbury Bank, is the responsibility of

[3] Data for Dee west shellfish beds, 2005-2011, 80 data points, mean salinity 30.42 psu, median 30.6 psu, range 26.45-33.03 psu.

the Environment Agency, while the mussel fishery itself, since South Salisbury Bank is on the Welsh side of the estuary, is the responsibility of the Welsh Government.

The statutory conservation agencies responsible for protected area management and control of invasive species (among other things) are Natural England and the Countryside Council for Wales. Both the SAC and the SPA in the Dee estuary are cross-border, and the protected areas are dealt with by both agencies in cooperation with each other. It is reported, however, that in general CCW takes the lead for the whole Dee estuary, although Natural England is, of course, consulted.

This proliferation of organisations with different roles and responsibilities, particularly in relation to fishing, makes it essential that there is a single forum for stakeholder debate and discussion. This exists in the Dee in the form of the Dee Fisheries Liaison Group. This group has no formal statutory function, but includes all the statutory managers, as well as commercial and recreational fishermen. A spin-off from this Fisheries Liaison Group is a separate cockle 'sub-group' to discuss cockle related issues (which previously tended to dominate). Table 2 summarises the organisations involved in management of the Dee, while Table 3 lists the members of the Fisheries Liaison Group.

Table 2. Organisations involved in fisheries or ecosystem management in the Dee estuary, along with their role and responsibilities.

Organisation	Role / responsibilities
Environment Agency	Management of the cockle fishery; chair of the Fisheries Liaison Group. Requested BMP Ltd. to remove the cockles from South Salisbury after agreement by the cockle group (see below).
Welsh Government	Responsible for all other inshore fisheries in the Welsh part of the Dee, including the mussel fishery. Gave the relevant permissions to BMP Ltd. to allow mussel fishing in the Dee (see below).
Northwest IFCA	Responsible for all other inshore fisheries in the English part of the Dee.
Countryside Council for Wales	Responsible for conservation for the Welsh part of the Dee – key issues are the protected areas and mitten crabs. Take a lead on conservation issues for the whole Dee estuary. The Code of Good Practice for invasive species is agreed between BMP Ltd. and CCW, and CCW oversaw implementation of the system set out in the code in this case.
Natural England	Responsible for conservation for the English side of the Dee. Mainly leaves CCW to deal with the entire estuary, but are consulted on key issues.
Marine Management Organisation MMO	Responsible for licensing, enforcement and data collection from commercial fishing vessels. Not much involved in this case but a member of the Fisheries Liaison Group.

Fisheries Liaison Group	Stakeholder group for fisheries in the Dee estuary, including commercial and recreational fishermen plus all the organisations listed above. Full membership given in Table 3.
Cockle sub-group	Informal offshoot of the Fisheries Liaison Group to provide forum for discussing issues related to the cockle fishery.

Table 3. Members of the Fisheries Liaison Group.

Member	Role
Environment Agency	Chair – also of cockle group
Cockle fishermen	Also members of cockle group
Shrimp trawlers	Commercial fishing stakeholders
Flounder netters	Commercial fishing stakeholders
Anglers	Recreational fishing stakeholders
Northwest IFCA	Inshore fisheries management – England
Welsh Government	Inshore fisheries management - Wales
MMO	Commercial fisheries licensing / enforcement – UK
CCW	Conservation – Wales
Natural England	Conservation – England (NB does not usually attend)

3.2. THE PROCESS LEADING TO MUSSEL FISHING IN THE DEE IN 2011

Settlement of mussels on cockle shell in the Dee estuary was first noted in 2009, although on a relatively small scale. The area of seed expanded in 2010, such that by the end of the year, there was concern that it posed a significant threat to the cockle fishery (by far the most valuable commercial fisheries in the estuary). The Fisheries Liaison Group (cockle sub-group) discussed the issue several times, and agreed early in 2011 to mandate the Environment Agency to contact BMP Ltd. to enquire about removing the seed from South Salisbury Bank.

As noted above, BMP Ltd. immediately recognised two issues: i) the MSC UoC (process outlined above) and ii) the fact that the Dee estuary is not included as an accepted site in the Code of Good Practice, and that the Dee is known to have a population of invasive Chinese mitten crabs – one of the species named in the Code of Good Practice. BMP Ltd. contacted CCW in March 2011 to discuss the issue, and joint meetings were held between BMP Ltd., CCW, the Environment Agency, the Welsh Government and Bangor University scientists to discuss an appropriate protocol for assessing the risk.

The Code of Good Practice (Wilson & Smith, 2008) sets out the general procedure by which areas can be assessed to estimate the risk of translocation of invasive species into the Strait: after independent surveys and an analysis of the life history of the species in question, areas are categorised red, orange or green. Mussels can only be moved between areas in the same or higher risk category – the Menai Strait being 'green', the Dee estuary had to be categorised 'green' for mussel fishing to be permitted. Note, however, that

areas can have different risk status at different times, and the life history of the mitten crab is helpful in the sense that it retreats into freshwater during the summer. South Salisbury Bank is at the mouth of the estuary, in almost fully marine conditions (see Figure 1).

BMP Ltd. contracted Dr. Andrew Woolmer, an independent marine biologist, to undertake independent surveys at the proposed fishing site (Woolmer, 2011 – see Section 1), following a screening process agreed with CCW as follows:

1. Sub-tidal dredge survey: Thirty-five dredge samples were taken on 22 July 2011 and the samples examined for adult and juvenile mitten crabs. No mitten crabs were found

2. Intertidal site screening: This survey in early August 2011 used timed-searches - a commonly used methodology for detecting rare or cryptic species which is used elsewhere for screening mussel beds for invasive species (e.g. it is required by authorities in Northern Ireland before movement of mussels into their jurisdiction). No mitten crabs were found.

Dr. Woolmer concluded i) that the survey techniques he used (including sieving samples to detect very small crabs) were appropriate for detecting the presence of mitten crabs even at low density and ii) therefore, since he did not find any, mitten crabs were unlikely to be present in the area at that time. CCW accepted these results and accepted that fishing could go ahead under the Code of Good Practice under the following conditions:

1. Fishing only permitted i) until the end of September or ii) until there are any reports of mitten crabs in the estuary;

2. Mussel dredgers must have observers on board to check the catch for mitten crabs.

The Welsh Government also accepted this conclusion and gave the necessary permissions, which were:

1. Permit to remove undersized mussels from the Dee estuary;

2. Permit to fish in the Dee estuary with oversized vessels;

3. Permit under the ‘control of deposits’ regulations to move mussels from the Dee to the Menai Strait (this is a set of regulations which aim to reduce the risk of translocation of invasive species).

The Welsh Government also imposed a TAC of 1000 tonnes for the fishery. The basis for this TAC was unclear to everyone, including the Environment Agency who had assumed that the fishery would take all the mussels away from South Salisbury Bank (biomass estimates were around 1000-1500 tonnes at that point). It is presumed, however, that the Welsh Government wished to leave some mussels in place for birds, even though due to the infrequency of mussel settlement, mussels are not a habitual prey for birds in the Dee estuary (see Table 1 above). In any case, because of constraints of time and tides there

was no time to question this decision so it remained in place and was respected by BMP Ltd.

The vessels (Valente and Mare Gratia) fished two spring tides in August and September 2011. Observers from Bangor University were present on board throughout fishing activities, and did not find any mitten crabs in the catch. It had been intended to fish a third spring tide at the end of September, however after an unconfirmed report of a mitten crab elsewhere in the estuary, it was decided to stop fishing. Overall, 1000 tonnes were taken – BMP Ltd. had intended to request an increase in the TAC for the final fishing tide, however this turned out to be unnecessary.

4. EVALUATION PROCESS

4.1. EVALUATION PROCESS FOR RIVER DEE

The assessment and scoring of the River Dee was carried out in an identical way to the other sources of seed (see Public Certification Report for full details). The assessment and team were announced on the MSC website on 16th August 2011, and communicated to stakeholders on 11th August 2011. The site visit and scoring meeting were held in Bangor on 26-27 October 2011. The peer review reports were received on 30th November, 2011. The participants in the site visit are given in Table 4.

Table 4. List of participants in the site visit for the River Dee

Name	Affiliation	Notes
James Wilson	Deep Dock Ltd. / BMP	BMP - client
Trevor Jones	Extramussel Ltd. / BMP	BMP - client
Jim Andrews	Consultant	Advisor to BMP Ltd.
Roland Sharp	CCW	Responsible for fisheries-related issues
Colin Brannan	MSC	Observer
Claire Pescod	MSC	Observer
Jo Gascoigne	MEP	Assessor
Andrew Brand	MEP	Assessor

The scoring for the River Dee included only a proportion of the Performance Indicators, because some of them had no additional issues to consider as a result of the addition of the River Dee to the UoC. Table 5 lists the PIs, and explains why they were / were not included in this assessment.

Table 5. PIs included / not included to the River Dee in the context of the North Menai Strait mussel fishery.

Principle	Component	PI number	PI	Included ?	Rationale
One	Outcome	1.1.1	Stock status: outcome	N	Scored using RBF
		1.1.2	Reference points	N	Default score when using RBF
		1.1.3	Stock rebuilding	N	n/a
		1.1.4	Genetic outcome	Y	Genetic outcome of translocations from Dee
	Management	1.2.1	Harvest strategy	Y	Harvest strategy for Dee
		1.2.2	Harvest control rules and tools	Y	HCR for Dee
		1.2.3	Information and monitoring	Y	Information / monitoring for Dee
		1.2.4	Assessment of stock status	N	Default score when using RBF
		1.2.5	Genetic management	Y	Ensure management applied to Dee
		1.2.6	Genetic information	Y	Review information for Dee
Two	Retained spp.	2.1.1	Outcome	Y	All of Principle 2 is applicable to the River Dee – all scored.
		2.1.2	Management	Y	
		2.1.3	Information	Y	
	Bycatch	2.2.1	Outcome	Y	
		2.2.2	Management	Y	
		2.2.3	Information	Y	
	ETP species	2.3.1	Outcome	Y	
		2.3.2	Management	Y	
		2.3.3	Information	Y	
	Habitats	2.4.1	Outcome	Y	
		2.4.2	Management	Y	
		2.4.3	Information	Y	
	Ecosystems	2.5.1	Outcome	Y	
		2.5.2	Management	Y	
		2.5.3	Information	Y	
Three	Governance and policy	3.1.1	Legal / customary framework	Y	Dee not identical to other sites – cross-boundary
		3.1.2	Consultation,	Y	Dee not identical to

			roles and responsibilities		other sites – cross-boundary, some different organisations involved (e.g. Env. Agency
		3.1.3	Long-term objectives	N	Long-term objectives (from Natura 2000) the same as at the other seed sites
		3.1.4	Incentives for sustainable fishing	N	Applies to fishery in general rather than collection sites specifically
	Fishery-specific management system	3.2.1	Fishery-specific objectives	N	Applies to fishery in general rather than collection sites specifically
		3.2.2	Decision-making processes	Y	Review processes as applied to decision to fish Dee
		3.2.3	Compliance and enforcement	N	Applies to fishery in general – not site specific
		3.2.4	Research plan	N	Applies to fishery generally
		3.2.5	Management performance evaluation	N	Applies to fishery generally

4.2. RELEVANT INFORMATION FROM PREVIOUS ASSESSMENT

Notwithstanding the above, peer reviewer 1 requested additional information on the scoring of PI 1.1.1 by the Risk-Based Framework. The RBF considered the entire mussel stock of the eastern Irish Sea, which is why it was not necessary to re-run the exercise for this assessment. The outcomes of the SICA and PSA are summarised below.

Table 6. Summary outcome of SICA assessment for Principle 1, north Menai Strait mussel fishery.

PI	Activity	Spatial scale	Temporal	Intensity	Sub-component	Consequence score	MSC Score
1.1.1	Fishing for mussel seed	1	3	2	Population size	**1**	**100**
1.1.1	Prospecting for seed	1	3	2	Population size	**1**	**100**

Summary rationale:

- The fishery takes place in a very limited area relative to the population;
- The fishery takes place on mussels which are usually lost to the population after only one summer;
- The mussels are relaid in the same population area, where they will spawn as normal for 2-2.5 years until harvest.

Therefore, the impact of the fishery and seed prospecting on the stock was considered by stakeholders to be negligible.

As shown above (Table 6) stakeholders agreed that the fishery, as well as seed prospecting, had a negligible impact on the stock. Since the definition of the stock includes the River Dee as well as the other seed collecting sites and the Menai Strait, and the stakeholder group attending the River Dee site visit was a subset of the group participating in the original assessment (see Table 4 and MEP 2010), this outcome applies in this case.

The PSA assesses the 'productivity' of the stock and its 'susceptibility' to the fishery. Mussels gain the maximum score for productivity (score 1 = high productivity in all categories) for the following reasons:

- Partial spawning in first year, full spawning by second year (age at maturity);
- Average maximum age variable but estimated ~8 years;
- High fecundity (~10^9 eggs per female per year);
- Maximum size ~6-7cm;
- Size at maturity ~1-3cm;

- Broadcast spawner;
- Low trophic level

For susceptibility, this fishery scored as follows (1 = low, 3 = high):

- Availability – mainly not fished throughout its range in the Irish Sea; score = 1
- Encounterability – cannot be fished by dredge in main habitat (rocky intertidal), also partially inaccessible to hand gathering; score = 1
- Selectivity – dredges can take all sizes; score = 3
- Post-capture mortality – mussels relaid alive; score = 1

The overall MSC score[4] from this PSA analysis is 99.9 – this score is given in PI 1.1.1 rounded to the nearest whole number (i.e. 100).

5. ASSESSMENT RESULTS

5.1. PRINCIPLE 1

The scores for each PI for Principle 1 are shown in Table 7. For the PIs that do not apply to the River Dee separate from the rest of the fishery, only one score is given.

Table 7. Scores for each PI for Principle 1.

Component	PI	previous	Dee	overall
Outcome	Stock status	99.9		
	Reference points	80		
	Stock rebuilding	n/a		
	Genetic outcome	80	80	80
Harvest strategy (management)	Harvest strategy	85	85	85
	Harvest control rules and tools	80	80	80
	Information/monitoring	80	80	80
	Assessment of stock status	80		
	Genetic management	90	90	90
	Genetic information	85	85	85

There are no differences in the scores, and therefore the overall outcome for Principle 1 is not changed by this addition to the UoC.

[4] Calculated as follows: Productivity score = arithmetic mean of scores (P=1); susceptibility score = geometric mean of scores (S=1.05). Overall PSA score = $\sqrt{(P^2 + S^2)}$ = 1.45. MSC score comes from following linear regression: $-11.956(PSA)^2 + 32.28(PSA) + 78.259 = 99.91$.

5.2. PRINCIPLE 2

The scores for each PI for Principle 2 are shown in Table 8.

Table 8. Scores for each PI for Principle 2.

Component	PI	previous	Dee	overall	Explanation for differences
Retained species	*Average retained spp.*	*100*	*100*	*100*	
	Outcome	100	100	100	
	Management	100	100	100	
	Information	100	100	100	
By-catch	*Average bycatch*	*73.3*	*80*	*80*	
	Outcome	80	80	80	
	Management	80	80	80	
	Information	60	80	80	Information gathered in order to meet condition
ETP species	*Average ETP*	*83.3*	*86.7*	*83.3*	
	Outcome	90	90	90	
	Management	80	85	80	New team thought that original scores were somewhat harsh
	Information	80	85	80	
Habitat	*Average habitat*	*91.7*	*96.7*	*91.7*	
	Outcome	95	100	95	95 score overall due to habitat alterations in Menai Strait not seed collection areas
	Management	100	100	100	
	Information	80	90	80	Original score 90 for seed collection areas, 80 when Menai Strait included – no change
Ecosystem	*Average ecosystem*	*90*	*93.3*	*91.7*	
	Outcome	80	80	80	
	Management	100	100	100	
	Information	90	100	95	Information gathered to meet condition, concerns over eider ducks do not apply to Dee

Despite a few small differences in the scores, the overall outcome for Principle 2 is not changed by this addition to the UoC. The average score changes slightly from 87.7 to 89.3.

5.3. PRINCIPLE 3

The scores for each PI are shown in Table 9.

Table 9. Scores for each PI for Principle 3.

Component	PI	previous	Dee	overall
Governance and policy	Legal and/or customary framework	90	95	90
	Consultation, roles and responsibilities	90	85	85
	Long term objectives	80		
	Incentives for sustainable fishing	90		
Fishery-specific management system	Fishery-specific objectives	80		
	Decision-making process	90	90	90
	Compliance and enforcement	90		
	Research plan	70*		
	Monitoring and management performance evaluation	90		

* See annual surveillance report for Year 1 – published separately.

The difference in score for PI 3.1.2 arises from the very complex management regime for the River Dee, meaning that roles and responsibilities are less clearly defined than for the other parts of the fishery.

Despite a few small differences in the scores, the overall outcome for Principle 2 is not changed by this addition to the UoC. The average for 'governance and policy' decreases slightly from 87.5 to 86.25.

5.4. PROPOSED CERTIFICATION RECOMMENDATION

On the basis of the above scores, MEP's preliminary recommendation was that the Dee **can be** certified as sustainable according to the MSC standard, and therefore **can be** added to the UoC.

The MEP Certification Committee met on the 26th March 2012 to consider the report, peer reviews and stakeholder comments, and concluded that the River Dee **should** be incorporated into the UoC for this fishery.

6. TRACKING AND TRACING OF FISH PRODUCTS

The critical issue arising for the tracking and tracing of products from the fishery is that the mussels harvested from the River Dee in 2011, are already on lays in the Menai Strait, even though the addition of the Dee to the UoC for this fishery has not yet been agreed. This arose because there was only a tight window in which the harvesting could take place in the Dee while minimising the risk of the presence of mitten crabs. It was therefore agreed between the fishery and MEP that the harvesting could go ahead before the River Dee was assessed under the MSC standard. However, it was agreed that these mussels would be kept on separate lays and not mixed with other mussels, so that in the event that the River Dee cannot be added to the UoC, they could be raised and sold as non-MSC mussels. This would obviously imply a change to the chain of custody requirements from the current situation where all mussels produced by members of BMP Ltd. are MSC certified.

As noted above, the preliminary recommendation from MEP is that the River Dee **does** meet the requirements of the MSC standard and therefore **can** be added to the UoC.

7. SURVEILLANCE SCHEDULE

In accordance with the new Certification Requirements v1.2, in force since January 2012, the frequency of future surveillance visits was calculated for this Unit of Certification. The overall surveillance score is calculated by adding the scores from table 10 and matching those with the Surveillance Level in table 11. As the UoC for this fishery is being extended, a surveillance score was calculated for both the original UoC (as per MEP-F-002) and the River Dee extension of the UoC and the highest score was adopted, as shown in the tables below.

This fishery's score was calculated at 3 which implies a normal surveillance level with annual on-site surveillance audits.

Table 10. Criteria to determine Surveillance Score (see Certification Requirements v1.2, Section 27.22.1.1)

Criteria	Surveillance Score	UoC as per MEP-F-002	River Dee UoC extension
1. Default Assessment Tree used?			
Yes	**0**	**2**	**2**
No	**2**		
2. Number of conditions			
Zero conditions	**0**	**1**	**0**
Between 1 – 5	**1**		
More than 5	**2**		
3. Principle level Scores			

≥85	**0**	**0**	**0**
≤85	**2**		
4. Conditions on outcome PIs?			
Yes	**2**	**0**	**0**
No	**0**		
Total Score		**3**	**2**

Table 11. Surveillance level (see Certification Requirements v1.2, Section 27.22.1.3)

			Years after certification or recertification			
Surveillance score (from Table C3)	**Surveillance level**		**Year 1**	**Year 2**	**Year 3**	**Year 4**
2 or more	Normal Surveillance		On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & recertification site visit
1	Remote Surveillance	Option 1	Off-site surveillance audit	On-site surveillance audit	Off-site surveillance audit	On-site surveillance audit & recertification site visit
		Option 2	On-site surveillance audit	Off-site surveillance audit	On-site surveillance audit	
0	Reduced Surveillance		Review of new information	On-site surveillance audit	Review of new information	On-site surveillance audit & recertification site visit

ANNEX 1 – ASSESSMENT TREE

For this assessment tree, we present only the PIs which are relevant to the River Dee and were therefore scored by the assessment team (see Table 5 above). For an explanation of which PIs are relevant for which sites and how the full list of PIs were agreed, see the main Public Certification Report for this fishery.

Principle 1

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

1.1.4 Genetic outcome

The fishery has negligible discernable impact on the genetic structure of the population

SG 60: Possible detectable change in genetic structure but minimal impact at population level. Any change in frequency of genotypes, effective population size or number of spawning units up to 5%.

SG 80: No detectable change in genetic structure. Unlikely to be detectable against background variability for this population.

SG 100: No interactions leading to impacts on genetic structure.

Score for previous assessment: 80

Score for River Dee: 80

Overall score: 80

Rationale

The previous assessment concluded:

1. The Irish Sea could be considered as a single stock for *M. edulis*;
2. There is no evidence of *M. galloprovincialis* or *M. trossulus*, or hybrids, in the Irish Sea;
3. On this basis, SG 80 is met
4. However, potentially risk-causing activities exist, and there is the potential for future change – so SG100 should not be met.

The River Dee assessment team concluded that the addition of the River Dee to the UoC made no change to this logic or these conclusions. Therefore the score remains 80.

1.2 Harvest strategy (management)

1.2.1 Harvest strategy

There is a robust and precautionary harvest strategy in place

SG 60: The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.

The harvest strategy is likely to work based on prior experience or plausible argument.

Monitoring is in place that is expected to determine whether the harvest strategy is working.

SG 80: The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.

The harvest strategy may not have been fully tested but monitoring is in place and evidence exists that it is achieving its objectives.

SG 100: The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.

The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.

The harvest strategy is periodically reviewed and improved as necessary.

Score for previous assessment: 85

Score for River Dee: 85

Overall score: 85

Rationale

The previous assessment concluded:

1. The harvest strategy is responsive to the amount of recruitment in a given area rather than to the stock status, which it is assumed is either unaffected or positively affected by this fishery. The proportion of recruitment that can be taken by the fishery depends on the evaluation of conservation bodies about the ecosystem role of seed mussel beds, which is deemed to be potentially significant in Morecambe Bay but not so much elsewhere.
2. For SG80, the assessment team concluded that the harvest strategy could be responsive to the state of recruitment if necessary. Since both Morecambe Bay and Caernarfon Bay are in or adjacent to protected areas (SACs) the seed collecting activity is subject to approval by Natural England and CCW respectively. If deemed necessary, a TAC could be imposed, as has happened in the past in Morecambe Bay. The various participants in management have a history of working together well. They concluded that SG80 was met.

3. For SG100, the team concluded that the harvest strategy was well-designed, but in relation to stock status it has not been quantitatively evaluated, nor is it systematically reviewed and updated (except in as much as the recent changes to inshore fisheries management has led to a one-off review process). The team concluded that one part of SG100 was met, leading to a score of 85.

For the River Dee, the harvest strategy was mainly designed to ensure that Chinese mitten crabs were not translocated with mussels – however this issue is dealt with under Principle 2. For Principle 1, the situation in the River Dee is essentially the same as for the other seed sites – part way between the two, in the sense that Morecambe Bay is in England, Caernarfon Bay in Wales and the Dee estuary in both. While the management system for inshore fisheries in the Dee is perhaps excessively complicated, it seems to have functioned very effectively in this case. The River Dee assessment team concluded that the above logic applied to the River Dee in an identical way, giving a score of 85.

1.2.2 Harvest control rules and tools

There are well defined and effective harvest control rules in place

SG 60: Generally understood harvest control rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.

There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.

SG 80: Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.

The selection of the harvest control rules takes into account the main uncertainties.

Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.

SG 100: Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.

The design of the harvest control rules take into account a wide range of uncertainties.

Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.

Score for previous assessment: 80

Score for River Dee: 80

Overall score: 80

Rationale

The previous assessment concluded:

1. This fishery has no net impact on the stock size. The objectives of the seed harvest control rules are therefore to ensure that the available seed is shared between the fishery and other components of the ecosystem, where relevant.
2. For both seed collection areas, the 'harvest control rule' is essentially that there is an assessment of likely impact, approved by the statutory conservation agency. The powers are in place for a TAC to be set at both sites, but in recent years it has not been considered necessary.
3. For SG80, the team considered that the harvest control rules are well defined and consistent with the harvest strategy. The exploitation rate can if necessary be reduced according to the amount of seed available. The main uncertainty is the extent to which predators rely on the seed beds – which is taken into account. The system appears to be appropriate, effective and precautionary. SG 80 is met.
4. For SG100, the team felt that the harvest control rules are basically *ad hoc*, and while they appear to be working they are not based on a sophisticated design or a quantitative understanding of ecological relationships. Thus SG 100 is not met.

For the River Dee, the assessment team concluded that the same logic applies. In this case, a TAC was set by the Welsh Government at 1000 tonnes, possibly as a precaution against impacts on bird populations (although this is not completely clear). Even if there had been no TAC, it is clear that the seed harvest is well controlled both from a fishery perspective and from a conservation perspective, in a similar or perhaps even stronger way than at the other seed collection sites. The team agreed a score of 80 on this basis.

1.2.3 Information / monitoring

Relevant information is collected to support the harvest strategy

SG 60: Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.

Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule

SG 80: Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.

Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.

There is good information on all other fishery removals from the stock.

SG 100: A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as

environmental information), including some that may not be directly relevant to the current harvest strategy, is available.

All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of the inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.

Score for previous assessment: 80

Score for River Dee: 80

Overall score: 80

Rationale

The previous assessment concluded:

1. Since the fishery does not affect the overall size of the stock, information directly about stock size is not relevant. The key relevant information is on i) annual recruitment at each of the seed collection sites; and ii) seed removals by the fishery.
2. This information is collected each year at the relevant scale and level of precision required to estimate the biomass on the seed beds. There are no other fisheries removals from the two seed collection sites.
3. On this basis SG 80 was met. However they considered that a 'comprehensive' range of information to manage the fishery would involve more ecological and environmental information than is currently available, and the team did not consider that there was a 'high degree of certainty' about the system so SG 100 is not met.

Again, in relation to the River Dee, the assessment team concluded that exactly the same logic applies. The seed beds were surveyed and biomass estimated on two occasions in 2011 (spring – estimated at 3000 tonnes, summer – estimated at 1000-1500 tonnes). Fisheries removals are known (1000 tonne TAC, 1000 tonnes removed). Ecological and environmental information is similar to that available for Morecambe Bay. The same score of 80 was given.

1.2.5 Genetic management

There is a strategy in place for managing translocations such that the fishery does not pose a risk of serious or irreversible harm to the genetic diversity of the population

SG 60: There are measures in place, if necessary, which are expected to maintain the genetic diversity of the population at levels compatible with PI 1.1.4. The measures are considered likely to work, based on plausible argument (e.g general experience, theory or comparison with similar fisheries/species).

SG 80: There is a partial strategy in place, if necessary, which is expected to maintain the genetic diversity of the population at levels compatible with PI 1.1.4. There is some

objective basis for confidence that the partial strategy will work, based on some information directly about the population involved.

SG 100: There is a strategy in place to maintain the genetic diversity of the population at levels compatible with PI 1.1.4, based on in-depth knowledge of the genetic structure of the population. The strategy is being fully implemented

Score for previous assessment: 90

Score for River Dee: 90

Overall score: 90

Rationale

The previous assessment concluded that the genetic strategy presented by BMP Ltd. was sufficient to give a score of 90. The River Dee assessment team confirmed that samples from the River Dee had been sent for testing according to the strategy, as for the other sites. Unfortunately, due to illness of the scientist concerned, no results were available – however the team considered that given that the Dee is between Morecambe Bay and the Menai Strait / Caernarfon Bay, geographically speaking, it was implausible that the addition of the River Dee to the UoC would make any difference to this PI. The same score of 90 was therefore given.

1.2.6 Genetic information

Information on the genetic structure of the population is adequate to determine the risk posed by the fishery, if any

SG60: Qualitative or inferential information is available on the level of genetic structure within the population. Information is adequate to broadly understand the likely impact of the fishery. Information is adequate to support measures to manage genetic diversity, if necessary.

SG 80: Qualitative / inferential information and some quantitative or direct information is available on the genetic structure of the population. Information is sufficient to estimate the likely impact of the fishery. Information is adequate to support a partial strategy to manage main genetic impacts of the fishery on the stock.

SG 100: The genetic structure of the population is understood in detail. Information is sufficient to estimate the impact of the fishery with a high degree of certainty. Information is adequate to support a comprehensive strategy to manage genetic impacts, and evaluate with a high degree of certainty whether a strategy is achieving its objective.

Score for previous assessment: 85

Score for River Dee: 85

Overall score: 85

Rationale

As argued above, the addition of the River Dee to the UoC makes no difference to the assessment for this PI. The same score of 85 was given.

Principle 2

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

2.1 Retained species

2.1.1 Outcome status

The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species.

SG 60: Main retained species are likely to be within biologically based limits or if outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.

If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.

SG 80: Main retained species are highly likely to be within biologically based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.

SG 100: There is a high degree of certainty that retained species are within biologically based limits.

Target reference points are defined and retained species are at or fluctuating around their target reference points.

Score for previous assessment: 100

Score for River Dee: 100

Overall score: 100

Rationale

The previous assessment concluded that there were no ‘retained’ species in this fishery. The same applies to the River Dee.

2.1.2 Management strategy

There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species.

SG 60: There are measures in place that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.

The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).

SG 80: There is a partial strategy in place that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.

There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.

There is some evidence that the partial strategy is being implemented successfully.

SG 100: There is a strategy in place for managing retained species.

The strategy is mainly based on information directly about the fishery and/or species involved, and testing supports high confidence that the strategy will work.

There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its overall objective.

Score for previous assessment: 100

Score for River Dee: 100

Overall score: 100

Rationale

As outlined above, there are no retained species, leading to a default score of 100.

2.1.3 Information / monitoring

Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species

SG 60: Qualitative information is available on the amount of main retained species taken by the fishery. Information is adequate to qualitatively assess outcome status with respect to biologically based limits.

Information is adequate to support measures to manage main retained species

SG 80: Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.

Information is sufficient to estimate outcome status with respect to biologically based limits.

Information is adequate to support a partial strategy to manage main retained species.

Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).

SG 100: Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.

Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.

Information is adequate to support a comprehensive strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.

Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species

Score for previous assessment: 100

Score for River Dee: 100

Overall score: 100

Rationale

As outlined above, there are no retained species, leading to a default score of 100.

2.2 By-catch

2.2.1 Outcome status

The fishery does not pose a risk of serious or irreversible harm to the by-catch species or species groups and does not hinder recovery of depleted by-catch species or species groups.

SG 60: Main by-catch species are likely to be within biologically based limits, or if outside such limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.

If the status is poorly known there are measures or practices in place that are expected result in the fishery not causing the by-catch species to be outside biologically based limits or hindering recovery

SG 80: Main by-catch species are highly likely to be within biologically based limits or if outside such limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding

SG 100: There is a high degree of certainty that by-catch species are within biologically based limits

Score for previous assessment: 80

Score for River Dee: 80

Overall score: 80

A condition was put on the fishery after the full assessment (not including the River Dee) to improve quantitative data on bycatch species, after which bycatch surveys were carried out at Morecambe Bay and Caernarfon Bay. The result of this survey shows that at these sites there are no 'main' bycatch species. Similar quantitative data do not exist for the bycatch from the Dee – although scientific observers were on board the vessels for the duration of fishing, they were focused on detecting mitten crabs rather than on assessing bycatch more generally. According to the fishermen, there was no noticeable difference in bycatch from the Dee than from elsewhere (green crabs *Carcinus maenas* being the main species). The assessment team noted that the seed was reported to be hard-shelled (i.e. less likely to attract green crabs and other predators) and in general could see no reason why there should be any significant difference between the Dee and, for example, Morecambe Bay, which is a very similar type of ecosystem relatively close by.

On this basis, the team concluded that SG80 was met. To meet any part of SG100 would require better quantitative data than exist for the Dee.

2.2.2 Management strategy

There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations.

SG 60: There are measures in place, if necessary, which are expected to maintain main bycatch species at levels which are highly likely to be within biologically based limits or to ensure that the fishery does not hinder their recovery.

The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).

SG 80: There is a partial strategy in place, if necessary, for managing bycatch that is expected to maintain main bycatch species at levels which are highly likely to be within biologically based limits or to ensure that the fishery does not hinder their recovery.

There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or the species involved.

There is some evidence that the partial strategy is being implemented successfully.

SG 100: There is a strategy in place for managing and minimising bycatch.

The strategy is mainly based on information directly about the fishery and/or species involved, and testing supports high confidence that the strategy will work.

There is some evidence that the strategy is achieving its objective.

There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring.

Score for previous assessment: 80

Score for River Dee: 80

Overall score: 80

Rationale

As above, the assessment team concluded that are no 'main' bycatch species in this fishery, giving an automatic score of 80. Given this fact, and the fact that green crabs and starfish (the most abundant bycatch species) are ubiquitous in the Irish Sea, a 'strategy' for managing bycatch is not required. SG100 requires a strategy regardless of whether or not it is considered to be necessary, so this is not met.

2.2.3 Information / monitoring

Information on the nature and amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch

SG 60: Qualitative information is available on the amount of main bycatch species affected by the fishery.

Information is adequate to broadly understand outcome status with respect to biologically based limits.

Information is adequate to support measures to manage bycatch

SG 80: Qualitative information and some quantitative information are available on the amount of main bycatch species affected by the fishery.

Information is sufficient to estimate outcome status with respect to biologically based limits.

Information is adequate to support a partial strategy to manage main bycatch species.

Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).

SG 100: Accurate and verifiable information is available on the amount of all bycatch and the consequences for the status of affected populations.

Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.

Information is adequate to support a comprehensive strategy to manage bycatch, and evaluate with a high degree of certainty whether a strategy is achieving its objective.

Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.

Score for previous assessment: 60

Score for River Dee: 80

Overall score: 80

Rationale

The previous assessment was conditional on BMP Ltd. collecting better quantitative data on bycatch. This condition has now been met (see first annual surveillance audit) and has allowed the team to conclude that for Morecambe Bay and Caernarfon Bay there are no 'main' bycatch species. Although similar quantitative data is not available for the Dee, the assessment team concluded that it was reasonable to extrapolate from the other sites to the Dee, and that it was extremely probable that there were no 'main' bycatch species here either. The score for the Dee is therefore 80, and the new overall score is 80.

2.3 ETP species

2.3.1 Outcome status

The fishery meets national and international requirements for protection of ETP species. The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species.

SG 60: Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.

Known direct effects are unlikely to create unacceptable impacts to ETP species

SG 80: The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.

Direct effects are highly unlikely to create unacceptable impacts to ETP species.

Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts

SG 100: There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.

There is a high degree of confidence that there are no significant detrimental effects (direct and indirect) of the fishery on ETP species

Score for previous assessment: 90

Score for River Dee: 90

Overall score: 90

Rationale

As for the other seed sites, the main species of concern in the Dee estuary are birds, particularly since the area is designated an SPA. Good information is available on populations of birds using the Dee estuary, both in general terms (JNCC, 2011 (a)) and at any given moment (Dee Estuary Birding, 2011). The SAC listing also includes some key species, including sea lamprey, river lamprey and Atlantic salmon (JNCC 2001(b)), which pass through the estuary on migrations. The assessment team concluded that there was a negligible probability of impacts on these species from this fishery.

Of the birds for which the Dee estuary is important, oystercatchers and knot are known to prey on mussels (see Table 1 of the main report, Section 2 above). Eider duck are not listed on the SPA designation (JNCC, 2011 (a)), suggesting that populations in the Dee are not nationally or internationally significant, although they are reported to be present intermittently as winter visitors (Dee Estuary Birding, 2011). Knot are, however, only present on the Dee during the winter, and only eat small mussels, so the team concluded that the mussel bed fished in this case would not have been suitable as a foraging ground for knot. Oystercatchers are known to prey on large mussels, however oystercatchers in the Dee feed mainly on cockles. While the fishery may have removed some of their potential prey, it was carried out mainly to conserve cockle stocks – therefore overall it is reasonable to conclude that it had a neutral or positive impact on oystercatcher populations.

The assessment team also noted i) that CCW were happy to allow the fishery to proceed; ii) the TAC / curtailed fishing period left some mussels still on South Salisbury Bank; iii) mussels occur in the Dee only sporadically so are unlikely to play a major ecosystem role; iv) oystercatchers move between feeding areas in different estuaries (and the mussels were relaid in the Strait, where they are heavily predated by oystercatchers); and v) the area concerned made up a small part of the overall potential intertidal feeding area in the Dee estuary (see Fig. 3 in the main report).

On this basis, the team felt that SG80 was met, along with the second part of SG100 (there is a high degree of confidence of no significant detrimental effects). For the first part of SG100, the team questioned whether there was a 'high degree of certainty' given that direct quantitative information on bird feeding was lacking for the period up to and including the fishing. This led to an overall score of 90 – identical to the previous assessment.

2.3.2 Management strategy

The fishery has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the fishery does not pose a risk of serious or irreversible harm to ETP species; - ensure the fishery does not hinder recovery of ETP species; and - minimise mortality of ETP species.

SG 60: There are measures in place that minimise mortality, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.

The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).

SG 80: There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, that is designed to be highly likely to achieve national and international requirements for the protection of ETP species.

There is an objective basis for confidence that the strategy will work, based on some information directly about the fishery and/or the species involved.

There is evidence that the strategy is being implemented successfully.

SG 100: There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, that is designed to achieve above national and international requirements for the protection of ETP species.

The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.

There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is evidence that the strategy is achieving its objective.

Score for previous assessment: 80

Score for River Dee: 85

Overall score: 80

Rationale

For the Dee, oystercatchers are the only relevant species (see above). The assessment team concluded that there is a comprehensive strategy for managing oystercatchers and other birds in the Dee, because the area is designated as an SPA and because the many organisations involved in management work together very successfully. The team concluded that since overall the fishery is almost certainly having a positive impact on oystercatcher populations, due to the lays in the Menai Strait (Caldow *et al.*, 2003) – i.e. overall the fishery achieves above national and international requirements. Thus the first part of SG100 is met. For the second component, there is an objective basis for confidence that the strategy will work, but there has not been, as far as we know, a quantitative analysis, so this is met only at the 80 level. In terms of evidence of impacts of the fishery on oystercatchers, since this fishery was a one-off rather than an ongoing activity, it is hard to evaluate the outcome of the strategy quantitatively. This gives an overall score for the Dee of 85. The overall score for the whole assessment remains 80, because of the score for Morecambe Bay.

2.3.3 Information / monitoring

Relevant information is collected to support the management of fishery impacts on ETP species, including: - information for the development of the management strategy; - information to assess the effectiveness of the management strategy; and - information to determine the outcome status of ETP species.

SG 60: Information is adequate to broadly understand the impact of the fishery on ETP species.

Information is adequate to support measures to manage the impacts on ETP species.

Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.

SG 80: Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts.

Sufficient data are available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.

SG 100: Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.

Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.

Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.

Score for previous assessment: 80

Score for River Dee: 85

Overall score: 80

Rationale

As noted above, there is good information on oystercatcher populations in the Dee, and the outcome of the fishery in terms of impacts on these populations can be assessed with a high degree of certainty. Sufficient data are available to allow the fishery-related mortality on oystercatchers to be quantitatively assessed (in that it is almost certainly zero). However, the second two parts of SG100 are probably impossible to meet for this fishery, given that i) it is a one-off activity and ii) the oystercatchers in the Dee are part of a wider population or metapopulation that probably includes the Menai Strait. This gives an overall score of 85, compared to a score for the previous assessment of 80. The new overall score remains at 80 because of the score for Morecambe Bay.

2.4 Habitat

2.4.1 Outcome status

The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function.

SG 60: The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

SG 80: The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

SG 100: There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.

Score for previous assessment: 95

Score for River Dee: 100

Overall score: 95

Rationale

The previous assessment scored 100 for the seed collecting sites in relation to habitat impacts, plus 90 for impacts in the Menai Strait, leading to an overall score of 95.

For the seed collecting sites, the previous assessment concluded:

1. The areas subject to harvesting have a very small footprint, so that any adverse impact should be considered negligible when compared with other forms of towed bottom fishing gear. The fishery also occurs over a short period of time (a small number of spring tides).
2. The seed fishing sites are exposed to frequent erosion from waves and tides; seed mussels are often washed away or covered by mobile sand.
3. The impact of the fishing gear (traditional Dutch mussel dredges) on different habitats and under different environmental regimes is well understood. They are relatively light, have no tooth bar and harvesting occurs when the mussels have accumulated mussel-mud and are raised from the underlying substratum - hence the 'fabric' of the seabed is not directly impacted by the fishery.
4. On this basis, SG100 was met.

For the River Dee, the assessment team concluded that the same logic applies, although they noted that habitat is not the same (hard sandbanks rather than cobble skear). Nonetheless, infauna and epifauna on these sandbanks is similar to the fauna of the skears in Morecambe Bay, and is similarly impoverished with the exception of periodic high cockle biomass (pers. obs. of Jo Gascoigne in similar habitats at Traeth Lafan and Heysham Flats). On this basis, the score for the Dee is 100, with the overall score remaining 95.

2.4.2 Management strategy

There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types.

SG 60: There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.

The measures are considered to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).

SG 80: There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.

There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved.

There is some evidence that the partial strategy is being implemented successfully.

SG 100: There is a strategy in place for managing the impact of the fishery on habitat types.

The strategy is mainly based on information directly about the fishery and/or habitats involved, and testing supports high confidence that the strategy will work.

There is clear evidence that the strategy is being implemented successfully, and intended changes are occurring. There is some evidence that the strategy is achieving its objective.

Score for previous assessment: 100

Score for River Dee: 100

Overall score: 100

Rationale

For the previous assessment, the team concluded:

1. Both the fishery and the on-growing process is spatially restricted.
2. The fishery occurs inside or close to designated conservation areas (Morecambe Bay SAC and SPA, Menai Strait and Conwy Bay SAC, Traeth Lafan SPA). Therefore there is a high degree of scrutiny of these activities to ensure they do not compromise the conservation objectives. The conservation objectives of the SACs relate to habitats.
3. Since the fishery conducts most of its operations within SACs, which are managed under management plans that focus on habitats, a 'strategy' for habitats is in place.
4. These measures, together with the small footprint of the fishery and the resilience of the habitats and associated species that are affected by the fishery, lead to an SG100 score.

The Dee assessment team concluded that since the Dee is also designated an SAC (for intertidal sand and mudflat habitats) the same logic applies, leading to a score of 100.

2.4.3 Information / monitoring

Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types.

SG 60: There is a basic understanding of the types and distribution of main habitats in the area of the fishery.

Information is adequate to broadly understand the main impacts of gear use on the main habitats, including spatial extent of interaction.

SG 80: The nature, distribution and vulnerability of all main habitat types in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery.

Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent, timing and location of use of the fishing gear.

Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).

SG 100: The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.

Changes in habitat distributions over time are measured.

The physical impacts of the gear on the habitat types have been quantified fully.

Score for previous assessment: 80

Score for River Dee: 90

Overall score: 80

Rationale

The previous assessment concluded:

1. The habitats affected by the fishery are well described and quantified, and their vulnerability to fishing disturbance is well understood. The spatial and temporal extent of the fishery is limited. SG80 is therefore met.
2. SG100 is not met because the precise effects associated with the specific fishing gear used in this fishery have not been defined formally.

The assessment team for the Dee reviewed these conclusions but could not agree with them completely – particularly in relation to SG100. The team thought that i) the distribution of the habitat type in question (intertidal sand and mudflats) was known over their range – at least across the UK and western Europe; and that since this is considered to be an important habitat for the Natura 2000 network, changes in habitat distribution over time are measured over most of that range. They concurred, however, that the physical impacts of the gear have not necessarily been fully quantified. This gives a score of 90 for the River Dee. Note that this score does not reflect differences between the Dee and the other seed collection sites so much as differences in interpretation of SG100 between the two assessment teams. For this reason, the overall score has been left at the more conservative score.

2.5 Ecosystem

2.5.1 Outcome status

The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function.

SG 60: The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

SG 80: The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

SG 100: There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Score for previous assessment: 80

Score for River Dee: 80

Overall score: 80

Rationale

In the previous assessment, ecosystem impacts were divided into three categories: 1) predators of mussels, 2) issues of system carrying capacity, 3) risks associated with the introduction of non-native species. In this case, points 1) and 3) are potentially relevant.

In terms of predators, birds are dealt with under PIs 2.3 above. Other potential predators are green crabs and starfish (although since this site is in the intertidal, starfish are probably not significant). Green crabs and starfish are both generalist predators, and since mussels in the Dee estuary are an ephemeral resource, the assessment team were satisfied that any ecosystem impacts from this fishery via trophic effects on predators were extremely unlikely. This type of impact was therefore not considered further. (This issue is explored in more detail in the main assessment report for this fishery.)

The key non-native species of concern here is the Chinese mitten crab. The translocation of Chinese mitten crabs into the Strait is identified as a risk for the Dee fishery, since there is a risk of serious or irreversible harm should mitten crabs become established in the Strait / Ogwen River. The actions taken to mitigate this risk are outlined in detail above – they consist of i) independent pre-fishing surveys; ii) timing of the fishing activity in relation to mitten crab migrations between the estuary and freshwater and iii) observers on board during fishing to ensure no mitten crabs were found in the catch. The risk was minimised to the point at which CCW were happy to allow the fishery to proceed. On this basis, the team concluded that SG80 was met. The issue of 'evidence' is not really applicable here, so SG100 is not met.

2.5.2 Management strategy

There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function.

SG 60: There are measures in place, if necessary, that take into account potential impacts of the fishery on key elements of the ecosystem.

The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ ecosystems).

SG 80: There is a partial strategy in place, if necessary, that takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.

The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ ecosystems).

There is some evidence that the measures comprising the partial strategy are being implemented successfully.

SG 100: There is a strategy that consists of a plan, containing measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place.

The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem. This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.

The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.

There is evidence that the measures are being implemented successfully.

Score for previous assessment: 100

Score for River Dee: 100

Overall score: 100

Rationale

For the Dee, in relation to invasive species, there is a strategy that consists of a plan … or in this case, a Code of Good Practice that sets out the framework and procedure by which areas can be assessed for the risk of translocation of invasive species. The strategy was based on knowledge about the behaviour of mitten crabs in the Dee and the statutory conservation agency accepted that it reduced the risk to a negligible point, and was implemented successfully (surveys undertaken, observers on board, no evidence of mitten crabs found in seed beds, catch or Menai Strait).

Therefore, all elements of SG100 are met.

2.5.3 Information / monitoring

There is adequate knowledge of the impacts of the fishery on the ecosystem. Information is adequate to identify the key elements of the ecosystem (e.g. trophic structure and function, community composition, productivity pattern and biodiversity).

SG 60: Information is adequate to identify the key elements of the ecosystem (e.g. trophic structure and function, community composition, productivity pattern and biodiversity).

Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, but have not been investigated in detail.

SG 80: Information is adequate to broadly understand the key elements of the ecosystem.

Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, but may not have been investigated in detail.

The main functions of the Components (i.e. target, by-catch, retained and ETP species and habitats) in the ecosystem are known.

Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.

Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).

SG 100: Information is adequate to broadly understand the key elements of the ecosystem.

Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated.

The impacts of the fishery on target, by-catch, retained, ETP and habitats are identified and the main functions of these Components in the ecosystem are understood.

Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.

Information is sufficient to support the development of strategies to manage ecosystem impacts.

Score for previous assessment: 90

Score for River Dee: 100

Overall score: 95

Rationale

The conclusions of the previous assessment were that it is a data-rich fishery, with excellent information on most elements of the ecosystem. The fishery scored 90 rather than 100 because of a lack of quantitative information on bycatch (in particular, impacts on green crabs) and because of concerns about the role of the mussel seed beds in relation to eider ducks in Morecambe Bay.

As noted above (PIs 2.2.1, 2.2.2 and 2.2.3), the lack of quantitative information on bycatch has now been addressed, and the assessment team were happy to conclude that this information would also apply to the Dee. The issue of eider ducks is not relevant for the Dee (eider ducks are sporadic winter visitors only). For the key ecosystem impact of mitten crabs, there is good information available on i) mitten crab life history in the Dee; ii) mitten crab surveys on the seed beds, and iii) mitten crab surveys of the catch. Impacts of the fishery on the ecosystem in relation to introduction of mitten crabs in the Strait are hypothetical and therefore have not been investigated in detail – however, information is sufficient to ensure that it should never happen (at least due to this fishery). SG100 is met for the Dee. The overall score is now 95 because concerns about green crabs have been addressed, but minor concerns remain about eider ducks in Morecambe Bay.

Principle 3

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable

3.1 Governance and policy

3.1.1 Legal and/or customary framework

The management system exists within an appropriate and effective legal and/or customary framework which ensures that it: - Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; - Observes the legal rights created explicitly or by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework.

SG 60: The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.

The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.

Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.

The management system has a mechanism to generally respects the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

SG 80: The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.

The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery.

The management system or fishery is attempting to comply in a timely fashion with binding judicial decisions arising from any legal challenges.

The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

SG 100: The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.

The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.

The management system or fishery acts proactively to avoid legal disputes or rapidly implements binding judicial decisions arising from legal challenges.

The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom on people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

Score for previous assessment: 90

Score for River Dee: 95

Overall score: 90

Rationale

This PI is scored here because the management framework for the Dee is somewhat different to the other seed collection areas, because of the cross-boundary nature of the area and the involvement of the Environment Agency. The legal framework of the fishery is, however, the same as for other areas.

The management system for the River Dee is set out in detail in the main body of the report (Section 2 above). It is complicated, with a large number of organisations involved (Environment Agency, Welsh Government, Northwest IFCA, CCW, Natural England etc.). However, the various statutory bodies are brought together with stakeholders in the Fisheries Liaison Group (and associated cockle subgroup), which also includes commercial and recreational fisheries.

The mussel fishery by BMP Ltd. has been somewhat controversial in the Dee, which is the reason why it was not undertaken in 2009 or 2010, despite some mussel settlement in these years. Some attempts were made by local fishermen and hand gathers to remove the mussels, but by 2011 it was agreed at the cockle group that the settlement was too big for

that to be possible. Nonetheless, some cockle fishermen did disagree with the decision to invite BMP Ltd. to fish the mussels (the reasons for their disagreement was unknown), and the Port of Mostyn (on the Welsh side of the Dee – an important base for the offshore windfarms in the Irish Sea) also protested on the basis that they did not consider that they were consulted sufficiently. (They did not, however, have any actual disagreement with the activity itself as far as we could tell.) The decision was taken to proceed since the majority of the cockle group agreed with it. None of the objections have led to any legal disputes or judicial decisions.

On this basis, the assessment team concluded that i) the management system in the Dee achieved a mussel fishery in accordance with Principles 1 and 2 (see above); ii) the dispute resolution mechanisms is initially via stakeholder discussion – for which an excellent forum is available – followed by the usual legal processes (as for the rest of the fishery); iii) the explicit consultation of stakeholders can be regarded as a system to avoid proactively legal disputes in the fishery. The management system does not, however, commit formally to the rights of stakeholders – it is not required to take their views into account. Therefore, all of SG100 is met except the final point, leading to a score of 95.

3.1.2 Consultation, roles and responsibilities

The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties.

SG 60: Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.

The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.

SG 80: Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.

The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.

The consultation process provides opportunity for all interested and affected parties to be involved

SG 100: Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.

The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.

The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.

Score for previous assessment: 90

Score for River Dee: 85

Overall score: 85

Rationale

The organisations involved in the management of the fishery, and their roles and responsibilities, are set out in full in Table 2 of the main report. Their functions are explicitly defined and broadly well-understood, although given the complexity of the management system and the recent change in responsibilities in inshore fisheries management, it is clear that there will be some issues around the edges that will become better defined as time goes on. It was not clear to the assessment team, for example, who has the responsibility for performing an appropriate assessment for a fishing activity on the River Dee, should one be deemed to be necessary. In Morecambe Bay, the responsibility lies with the IFCA, while in Wales it nominally lies with the Welsh Government, however it is reported that for the Dee they would be likely to farm this out to the Environment Agency, who are notionally only responsible for the cockle fishery. Nonetheless, key areas of responsibility are well-defined, and, more importantly, the organisations work together to ensure that activities that need to happen do happen.

The management system includes a good consultation process (the Fisheries Liaison Group), which seeks and accepts information, including (especially) local knowledge, and encourages stakeholders to become involved. The assessment team did not know, however, the extent to which the statutory agencies explain how information is used or not used – this may be done during meetings, for example, but may not be done in every case. The creation of the Fisheries Liaison Group and the cockle sub-group has facilitated the effective engagement of stakeholders – for example in relation to decision-making about whether the mussel fishery should go ahead, as described above. Thus the last part of SG100 is met, but the other components are only met at the 80 level, giving a score of 85. The overall score was reduced to 85 on this basis.

3.2 Fishery-specific management system

3.2.2 Decision-making processes

The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives

SG 60: There are informal decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.

Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions

SG 80: There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.

Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.

Decision-making processes use the precautionary approach and are based on best available information.

Explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.

SG 100: There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.

Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.

Decision-making processes use the precautionary approach and are based on best available information.

Formal reporting to all interested stakeholders describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.

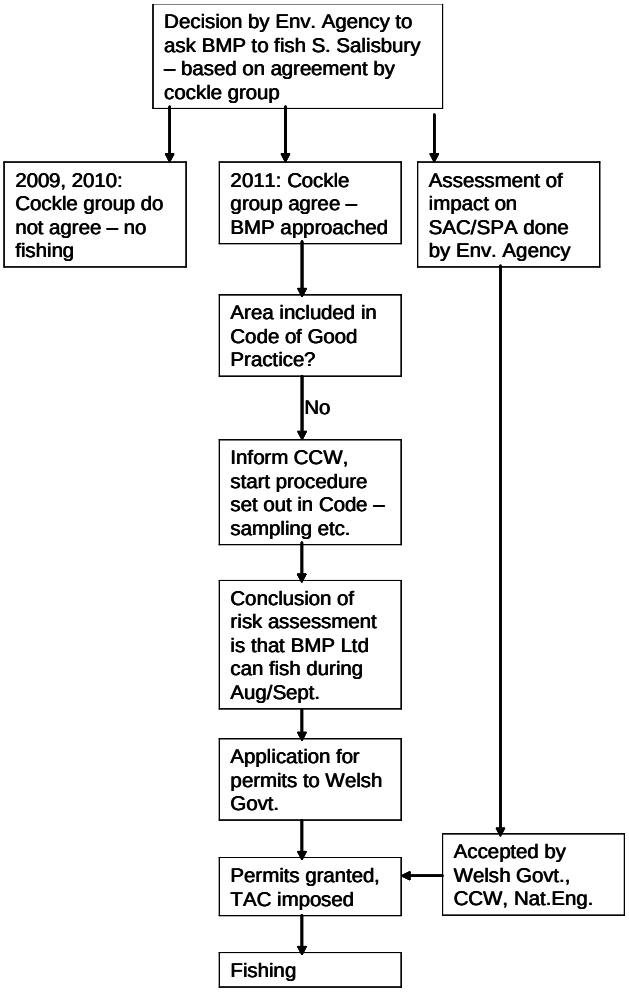
Score for previous assessment: 90

Score for River Dee: 90

Overall score: 90

Rationale

The assessment team found the decision-making process in the Dee complex enough to merit a diagram:



As for the rest of the fishery, it is clear that there are established decision-making processes – these may be complex but functioned well in this case. The processes clearly respond to serious and important issues – Chinese mitten crabs, notably. The various organisations and stakeholders work together to take decisions.

The decision-making system also takes the best available information into account – in fact, it has proved to be pro-active at gathering information, as demonstrated by the mitten crab surveys. SG 80 is met. As regards SG 100, the team considered that the system did not necessarily respond to all issues (e.g. there were some stakeholders that did not agree with the fishing). However, the requirement for formal reporting (as opposed to informal 'explanations') is met – e.g. via survey reports and the annual report of MSFOMA, leading to an overall score of 90, as given to the rest of the fishery.

ANNEX 2 - SUMMARY OF STAKEHOLDER COMMENTS

The only stakeholder to attend the site visit was Rowland Sharp of CCW. Representatives of the Environment Agency had hoped to attend but were prevented at the last minute.

The Welsh Government was invited to attend but did not respond. The assessment team was fortunate that Rowland Sharp was very well informed about the mitten crab issue and the fisheries management and conservation system in the Dee estuary.

No stakeholder comments were received by MEP either during the site visit or by other means that expressed concern about the fishery in the Dee estuary. Comments from CCW comprised factual information about the fishery and its management system. CCW also noted (as with the previous assessment) that they have a good relationship with members of BMP Ltd., and were pleased that they were contacted right at the start of the decision-making process for mussel fishing in the Dee.

No stakeholder comments were received by MEP during the 30-day consultation period for the Public Comment Draft Report

ANNEX 3 – PEER REVIEWER REPORTS

Peer review 1

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**Certification Body Response**
Justification: The evidence presented or described in all cases provides justification for the passing scores that were awarded. In the case of PIs 2.4.3 and 3.2.2, the scores might even be increased slightly, although without materially affecting the outcome of the assessment. The CB's preliminaryconclusion is that the Dee Estuary seed mussel fishery should be included in the certified North Menai Strait mussel fishery as an extension to the existing UoC; **this peer reviewer agrees with that conclusion.**		*No comments*

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**N/A**	**Certification Body Response**
Justification: No PIs scored lower than 80 and so no conditions were set.		*No comments*

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**N/A**	**Certification Body Response**
Justification: No PIs scored lower than 80 and so no conditions were set.		*No comments*

For reports using the Risk-Based Framework please follow the link.
For reports assessing enhanced fisheries please follow the link.

General Comments on the Assessment Report (optional)

NB: Throughout this peer review report, the following acronyms have been used:
DPFAR – Draft Partial Full Assessment Report (MEP 2011).
PCR – Public Certification Report (MEP 2010)
MEP response in green

Comments:

- The DPFAR report is generally clearly written and well structured.
- Information is generally presented in an appropriate format in order to understand how the scores for each PI were awarded. There were a number of places (as noted against the individual PIs in the table below) where information was very briefly summarised in the DPFAR but more information was needed from the PCR to allow this peer reviewer to understand how the assessment team reached their conclusion. Providing a little more detail in those cases would be helpful in avoiding any need to refer to the PCR.
- More information on Chinese mitten crab life history, with references provided, would be helpful. It is noted that the Natural Hisory museum provides a schematic representation of the life cycle of Chinese mitten crabs (http://www.nhm.ac.uk/resources-rx/files/chinese-mitten-crab-life-cycle-schematic-59984.pdf).

See responses to more detailed comments below.

A number of other comments can be made. These are listed below:

1. P.3, General Introduction. BMP is defined in the summary information, but BMPA is referred to here. Typo?

Indeed

2. P.6, Figure 1- 'Map of the Dee Estuary, including S. Salisbury'. However, South Salisbury is not marked. The location of the Bank, as well as the location of the seed that was taken (and the approximate location of any seed that was left after fishing ceased, if possible) is needed.

New Figure 2 added with exact position of seed gathering marked.

3. P.8, Protected Species. SPA- acronym.

Noted in the text

4. P.8. Protected Species. The existing text explaining what an SPA is could be improved. A suggestion from the JNCC website is that an SPA is "*A European designation that provides for the protection of all species of naturally occurring wild birds, in particular for rare or vulnerable species, and for regularly occurring migratory species.*" (JNCC SPA selection guidelines : http://jncc.defra.gov.uk/page-1405)

Included in the text. The original text was not intended to explain what an SPA was, it was intended to explain what it was in the River Dee. But the addition of a general explanation is good.

5. P.10. Habitats and Ecosystems. The existing text infers that an appropriate assessment may be needed for activities occurring within the Dee because it is an SAC. However, both the SPA and SAC designations require that an appropriate assessment is carried out for plans or projects that have a likely significant affect.

Yes, that's what we meant. Noted

6. P.14, The Process Leading to Mussel Fishing in the Dee in 2011. A reason for justifying that mitten crabs would not be found at the South Salisbury site is that the site "*is at the mouth of the estuary in almost fully marine conditions.*" However, no evidence is presented of the salinity regime at S.Salisbury. More information on the salinity tolerance of the crabs at different stages would also be useful. More information is available from the Natural History Museum (and probably elsewhere) (http://www.nhm.ac.uk/nature-online/species-of-the-day/biodiversity/alien-species/eriocheir-sinensis/life-history/index.html).

More detail has been provided on the mitten crab life cycle and on salinity conditions at the mouth of the Dee

7. P.14, The Process Leading to Mussel Fishing in the Dee in 2011. It is stated that 'mussels are not a habitual prey for birds in the Dee estuary (see Table 1 above).' However, knot and oystercatcher are listed in Table 1 as consuming mussels. I think what this may be trying to say is something along the lines of "*Few bird species within the SPA feed on mussels as a main prey item (Table 1), and the infrequency of mussel settlement in the Dee Estuary means that mussel are not in any case a habitual prey item within the SPA.*"

A briefer version of this sentence has been included which we hope is clear

8. P.15, Table 5. The preceeding paragraph refers to PIs that '*were / were not included*', then the Table title refers to PIs that are '*relevant / not relevant*', then the table column header refers to PIs being '*Included?*'. Sticking to a single form of outcome would be helpful.

Changed to 'included'

9. P.18, Table 7, and P. 19, Table 8. Summary explanations are provided for why the scores between the Dee and other seed collection sites within the existing certified fishery are provided. This is missing for the Habitat Outcome PI (Table 7), though, and for the Governance and Policy, Consultations, roles and responsibilities PI (Table 8).

Included

10. P.19, Section 8. It is stated that there was a tight window in which the harvesting could take place in the Dee without risk of the presence of mitten crabs. This should be "… *when the risk of the presence of mitten crabs was minimised.*"

Changed as suggested.

11. P. 27, PI 2.1.1. The text states that there are no retained species, but the PCR also noted that flatfish may be kept for personal consumption. The MSC provides little guidance on this specific matter, but these fish could have been considered here. In the PCR they are included in the bycatch PIs, but in the DPFAR, they aren't mentioned. Although it is accepted that the likely quantities and species taken mean that they probably don't qualify as main bycatch species, what species and how much would have been usefully included.

This is extremely occasional, amounting to certainly fewer fish (mainly plaice) than a semi-enthusiastic recreational fisherman would catch over the same period. The judgement of the assessment team was that this issue is trivial.

12. P. 32, PI 2.3.1. The text refers to the main species of concern in the Dee estuary are birds, particularly since the area is deisgnated an SPA. The site is also an SAC, though, with sea and river lamprey as qualifying features, and salmon (from the Dee River SAC) passing through. Although there is clearly only a very limited chance that these species would be impacted during the short duration of the fishery, showing that the assessment team had considered any impacts would have been helpful.

Noted. We considered the impacts and as suggested concluded that they were negligible.

Peer review 2

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**Certification Body Response**
Justification: **This report mirrors that for the original certification with the main exception of the issue relating to mitten crab. Adequate management and controls are in place to deal with this issue.**		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes**	**Certification Body Response**
Justification: **The report duplicates to a large extent the original certification for the Menai Strait mussel fishery. The issue of mitten crab is dealt with adequately, although this referee considers that a more thorough portfolio of published evidence to be presented in relation to the Life History of mitten crabs as this is critical to the assessment of the suitability of the measures.**		*More information has been added – peer reviewer 1 also requested this.*

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes/No**	**Certification Body Response**
Justification: ***I did not find any conditions within this report, however there is a thorough plan for mitigating the mitten crab problem which is the main issue with the proposed extension to the UoC***		*There were no conditions on the certification.*

For reports using the Risk-Based Framework please follow the link.

For reports assessing enhanced fisheries please follow the link.

General Comments on the Assessment Report (optional)

The consideration of ecosystem impacts 2.5 in relation to the potential introduction of mitten crab from the River Dee to the Menai Strait needs some further clarification and justification with peer reviewed literature. On the basis of the statements made the rationale and conclusions are sound, however this reviewer would have expected to have seen a greater emphasis put on the collection of scientific evidence to support these statements. Mitten crab are an extensively researched species and hence the assertions made regarding the timing of spawning and migrations to and from freshwater should be able to be supported through the use of peer reviewed literature. This referee would like to see a greater emphasis put on the compilation of this evidence base as this is the key issue in relation to the inclusion of the R Dee in the current UoA relating to the Menai Strait fishery. Given that most of the other information relating to the biology of the fishery remains the same, these issues are not of a concern. The Governance and management issues are well explained and appear to be robust through the very nature of the multiple processes that allow constant checks on the conduct of the fishery.

Much more information on the mitten crab life cycle in UK rivers has been added.

ANNEX 4 – REFERENCES

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