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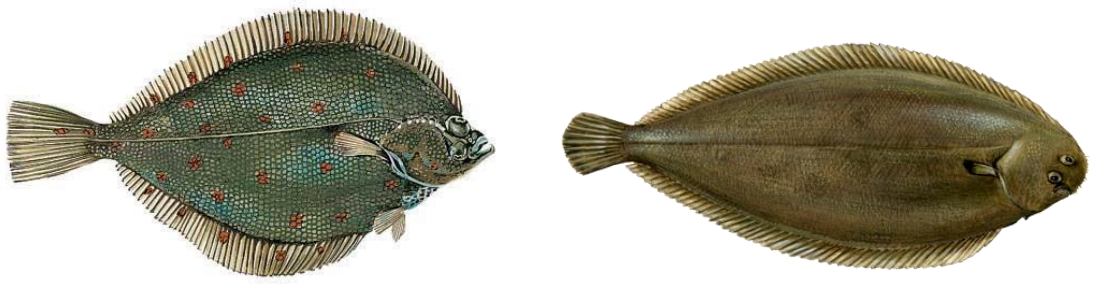
MSC SUSTAINABLE FISHERIES CERTIFICATION

CVO Pulse Sole and Plaice Fishery



Public Comment Draft Report

November 2016

Prepared For: **Coöperatieve Visserij Organisatie (CVO)**

Prepared By: **Acoura Marine Limited**

Public Comment Draft Report

December 2015

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Glossary

ACOM	ICES Advisory Committee
ASCOBANS	(Bonn Convention's) Agreement on the Conservation of Small Cetaceans in the Atlanto-Scandian and Baltic.
B_{lim}	Limit biomass reference point, below which recruitment is expected to be impaired.
B_{MSY}	Spawning Stock Biomass expected when exploiting stocks at maximum sustainable yield
B_{pa}	Precautionary reference point for spawning stock biomass
CFP	Common Fisheries Policy
CPUE	Catch per unit of fishing effort (e.g. kg/hr fished).
CR	MSC Certification Requirements
CVO	Coöperatieve Visserij Organisatie
EC	European Commission
EEZ	Exclusive Economic Zone
ETP	Endangered, threatened and protected species
EU	European Union
F	Fishing Mortality
FAO	United Nations Food and Agriculture Organisation
F_{lim}	Limit reference point for fishing mortality that is expected to drive the stock to the biomass limit in the long term
F_{MP} or F_{target}	Target fishing mortality under EU Multiannual Management Plan (MAMP)
F_{MSY}	Fishing mortality consistent with maximum long term yield
F_{pa}	Precautionary reference point of fishing mortality expected to maintain the SSB at the precautionary reference point in the medium term
HCR	Harvest Control Rule
ICES	International Council for the Exploration of the Sea
IMARES	Institute for Marine Resources & Ecosystem Studies
ITQ	Individual Transferable Quota
MAMP	EU Multiannual Management Plan for plaice and sole
MCS	Monitoring, Control and Surveillance
MLS	Minimum Legal (or where voluntary, Landing) Size for fish.
MSC	Marine Stewardship Council
MSY	Maximum Sustainable Yield
NEA	North East Atlantic
NEAFC	The North East Atlantic Fisheries Commission
NGO	Non-Governmental Organisation
NSRAC	North Sea Regional Advisory Council (now the NSAC)
OSPAR	Oslo-Paris Convention (Convention for the Protection of the Marine Environment of the North-East Atlantic)
P1	MSC Principle 1
P2	MSC Principle 2

P3	MSC Principle 3
PI	MSC Performance Indicator
Plaice Box	Protected area extending from 53^0N on the Dutch coast to 57^0N on the Danish coast from Netherlands to Denmark
PO	Producer Organisation
RAC	Regional Advisory Council
SG	Scoring Guidepost
SI	Scoring Issue
SSB	Spawning Stock Biomass
TAC	Total Allowable Catch
UNCLOS	United Nations Convention on the Law of the Sea
UoA	Unit of Assessment (
UoC	Unit of Certification – i.e. Definition of the fishery based on species, geographical area and gear
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis an age based fisheries model used to assess the state of fish stocks
WGNSSK	ICES Working Group on the Assessment of demersal stocks in the North Sea and Skagerrak
WWF	World Wide Fund For Nature

1. Executive Summary

» This report provides details of the MSC assessment process for the CVO pulse sole and plaice fishery for Coöperatieve Visserij Organisatie (CVO). The assessment process began on 26th March 2015 and was concluded (to be determined at a later date).

» A comprehensive programme of stakeholder consultations was carried out as part of this assessment, complemented by a full and thorough review of relevant literature and data sources.

» A rigorous assessment of the wide ranging MSC Principles and Criteria was undertaken by the assessment team and a detailed and fully referenced scoring rationale is provided in the assessment tree provided in **Appendix 1.1** of this report.

» The **Target Eligibility Date** for this assessment is the certification date.

The assessment team for this fishery assessment comprised of Rod Cappell who acted as team leader and primary Principle 3 specialist; Giuseppe Scarcella who was primarily responsible for evaluation of Principle 1 and Gudrun Gaudian who was primarily responsible for evaluation of Principle 2. Paul MacIntyre was the traceability expert advisor.

Client strengths

» The main strengths of the fisheries are the rigorous assessment of the North Sea sole and plaice stocks (showing both to be in good health) supported by a well-established multi-annual management plan.

» The North Sea marine environment is one of the most intensively studied ecosystems on earth and the client is active in gathering fishery-specific information. However, the information on the impacts of pulse fishing is in its infancy and time series from the fishery are not extensive.

» The use of pulse trawl gear clearly reduces the physical impact of the gear on the seabed.

» The general management framework and the specific fisheries management framework are comprehensive, which is further supported by good oversight of member vessels by the CVO.

Client weaknesses

» The primary weakness is the uncertainty on the impact of electricity from the gear on a range of environmental elements including ETP species (including elasmobranchs) and benthic organisms which may also have implications for the wider ecology of the area fished.

» Several research projects are in development under a wider research plan to address many of these uncertainties. Until these provide results and time series develop, the fishery lacks the certainty necessary at SG80 for several scoring issues.

» An official control protocol for this innovative gear technology was still to be implemented at the time of assessment (despite pulse vessels being part of the fleet for some years). This shows that decision-making processes are not always timely and effective control and enforcement cannot always be demonstrated. There is also indication from stakeholders that sanctions may not be applied consistently and the fines imposed are not an effective deterrent.

Determination

» On completion of the assessment and scoring process, the assessment team concluded that the fishery should not be certified at this time.

Rationale

» The limited evidence under several P2 Performance Indicators prevented the assessment team from determining that impacts were ‘highly likely’, which is a required at SG80.

» The cumulative result is that principle 2 does not achieve a score of 80 overall and therefore the fishery does not meet the MSC standard.

Conditions & Recommendations

A number of criteria, which contribute to the overall assessment score, scored less than the unconditional pass mark, and therefore trigger a binding condition to be placed on the fishery, which must be addressed in a specified timeframe (within the 5 year lifespan of the certificate). Further explanation of these conditions is provided in **Appendix 1.3** of the report, but in brief, the areas covered by these conditions are:

Condition number	Condition	Performance Indicator
1	Ensure the reference points are consistent with MSY	1.1.2 Reference Points
2	Ensure harvest control rules are consistent with MSY	1.2.2 Harvest Control Rules and Tools
3	Establish the impacts of the fishery on all ETP species are within acceptable levels.	2.3.1 ETP species outcome
4	Information on ETP impacts by the fishery is adequate to support the management strategy	2.3.3 ETP species information
5	Establish the impacts of the fishery on all habitats species are within acceptable levels.	2.4.1 Habitats outcome
6	Habitat management takes into account the impacts of the pulse fishery	2.4.2 Habitats management
7	Information on habitat impacts by the fishery is adequate to support the management strategy	2.4.3 Habitats information
8	Establish the impacts of the fishery on ecosystem components are within acceptable levels.	2.5.1 Ecosystem outcome
9	Ecosystem management takes into account the impacts of the pulse fishery	2.5.2 Ecosystem management
10	Information on ecosystem impacts by the fishery is adequate to support the management strategy	2.5.3 Ecosystem information
11	Decision-making processes are timely and precautionary	3.2.2 Decision-making processes
12	Control and enforcement is demonstrably effective and sanctions provide an effective deterrent.	3.2.3 Control and Enforcement

For interested readers, the report also provides background to the target species and fishery covered by the assessment, the wider impacts of the fishery and the management regime, supported by full details of the assessment team, a full list of references used and details of the stakeholder consultation process.

Acoura confirm that this fishery is within scope.

2. Authorship and Peer Reviewers

2.1 Assessment Team

All team members listed below have completed all requisite training and signed all relevant forms for assessment team membership on this fishery.

Assessment team leader: Rod Cappell

Primarily responsible for assessment under Principle 3

Rod Cappell is an independent fisheries consultant with over 20 years' experience in the sector. His company, Poseidon, is a fisheries and aquaculture consultancy delivering management and economics services to public and private clients. He has ongoing involvement in policy research for the European Commission on fisheries and maritime issues. Rod has extensive MSC auditor experience as Team Leader and P3 expert. He has been involved in the assessment of several fisheries in the Netherlands, including the CVO sole and plaice twin-rig fisheries. He was on the original assessment team for Osprey and CVO assessments and has been involved with subsequent surveillance audits of these and Ekofish.

Expert team member: Giuseppe Scarcella

Primarily responsible for assessment under Principle 1

Dr Giuseppe Scarcella is an experienced fishery scientist and population analyst and modeller, with wide knowledge and experience in the assessment of demersal stocks. He holds a first degree in Marine Biology and Oceanography (110/110) from the Unversità Politecnica delle Marche, and a Ph.D. in marine Ecology and Biology from the same university, based on a thesis "Age and growth of two rockfish in the Adriatic Sea". After his degree he was offered a job as project scientist in several research programs about the structure and composition of fish assemblage in artificial reefs, off-shore platform and other artificial habitats in the Italian Research Council – Institute of Marine Science of Ancona (CNR-ISMAR). During the years of employment at CNR-ISMAR he has gained experience in benthic ecology, statistical analyses of fish assemblages evolution in artificial habitats, fisheries ecology and impacts of fishing activities, stock assessment, otholith analysis, population dynamic and fisheries management. During the same years he attended courses of uni- multivariate statistics and stock assessment. He is also actively participating in the scientific advice process of FAO GFCM in the Mediterranean Sea. At the moment he is member of the Scientific, Technical and Economic Committee for Fisheries for the European Commission (STECF).

He is author and co-author of more than 30 scientific paper peer reviewed journals and more than 150 national and international technical reports, most of them focused on the evolution of fish assemblages in artificial habitats and stock assessment of demersal species. For some years now, Dr Scarcella has been working in fisheries certification applying the Marine Stewardship Council standard for sustainable fisheries, currently concentrating on Principle 1 of the Standard. Furthermore, Dr Scarcella holds the credential as Fishery team leader (MSC v2.0).

Expert team member: Gudrun Gaudian.

Primarily responsible for assessment under Principle 2

Dr Gudrun Gaudian is an experienced marine ecologist and taxonomist, including coastal and marine surveys, EIA's for development and tourism, and research projects in tropical and temperate seas. Work experience also includes coastal and marine management issues, such as identifying sustainable coastal development projects, as well as addressing conservation issues, including selection and planning of marine parks and reserves, sustainable utilisation of natural resources and community based management programmes. Projects have been undertaken in temperate, polar and tropical marine regions. For some years now, Dr Gaudian has been working in fisheries certification applying the Marine Stewardship Council standard for sustainable fisheries, currently concentrating on Principle 2 of the Standard. Furthermore, Dr Gaudian holds an LLM degree in Environmental Law and Management, giving a deeper understanding of law and policy dealing with such relevant issues

as the Common Fisheries Policy, water and waste management, and international environmental law including EU environmental policy.

Expert advisor: Paul MacIntyre

2.1.1 Peer Reviewers

Peer reviewers used for this report were John Nichols and Robert O'Boyle. A summary CV for each is available in the **Assessment downloads** section of the fishery's entry on the MSC website.

Robert O'Boyle

Robert O'Boyle received his B.Sc. and M.Sc. from McGill and Guelph Universities in 1972 and 1975 respectively. He was with Canada's Department of Fisheries and Oceans (DFO) at the Bedford Institute of Oceanography (BIO) in Dartmouth, Nova Scotia during 1977 - 2007. During this time, he conducted assessments of the region's fish resources (e.g. herring, capelin, cod, haddock, pollock, flatfishes, sharks). He headed the Marine Fish Division, with responsibility for the research programs and assessment-related activities of over 80 scientific and support staff. He subsequently coordinated the regional science advisory process for fisheries resources and ocean uses and as Associate Director of Science, managed science programs at the regional and national level. He has been involved in a number of national and international reviews, ranging from resource assessment and management to science programs. He is currently president of Beta Scientific Consulting Inc. (betasci.ca) which provides technical review, analyses and assessment of ocean resources and their management. Projects have included analyses and assessments of forage species (e.g. Atlantic Herring, Gulf and Atlantic Menhaden), deepwater species (e.g. Scotian Shelf Cusk) and endangered species (e.g. Atlantic Leatherback Turtles). He has been and is currently the principle one or two expert for a number of MSC certifications (e.g. BC Dogfish, Nova Scotia, US and Australian Swordfish, Barents Sea Cod, Haddock, and Saithe, North Sea and Baltic Sea Haddock and Danish Plaice, Deepwater Black Scabbardfish, Blue Ling, and Roundnose Grenadier, Russian Pollack and US West Coast groundfish) and is a member of the MSC's Peer Review College. He has been the chair and / or reviewer of numerous stock assessments and has prepared special reports on ocean management issues for government, industry and NGO groups. He was a member of the Scientific and Statistical Committee of the New England Fisheries Management Council during 2008-2016. He pursues research related to resource and ocean management and assessment and has published over 100 primary papers, special publications and technical reports. Recent projects include the impact of climate change on New England groundfish assessments, the trophic dynamics of the Eastern Scotian Shelf ecosystem, the impact of fish migrations on assessed fishery selectivity patterns, risk analysis in data poor assessments and the interaction of cod and grey seals in the Northwest Atlantic.

John Nichols

Mr John Nichols is a retired UK government fisheries biologist with 42 year's research experience in plankton ecosystems in the North Atlantic specializing in the taxonomy of North Atlantic & NW European plankton including phytoplankton, micro and meso-plankton, ichythoplankton and young fish. He has been a member of ICES working groups on herring, mackerel, horse mackerel, sardine and anchovy assessments; and mackerel and horse mackerel egg surveys. He was also a member of ICES study groups on herring larval surveys and plankton sampling.

He was scientist in charge of numerous research vessel surveys for fish stock assessment purposes and directly involved in the assessment of pelagic and western demersal fish stocks from 1994 to 2000.

He has been involved in the publication of over fifty scientific papers and reports more than half of which have been in peer reviewed journals, and the publication of two fish egg and larvae identification keys.

Since retirement from his government post he has participated in more than 27 different fisheries MSC assessments as the Principle 1 expert plus the re-assessments of many of those fisheries Those assessments include the Thames estuary herring, PFA North Sea Herring, NEA mackerel and Atlanto-Scandian herring, Hastings Fleet Dover sole, the north –east coast of England bass fishery, the SW mackerel hand line fishery, Portuguese sardine, a Newfoundland herring fishery, Canadian Pacific sablefish, various Norwegian and Swedish pelagic fisheries, Faroese and Norwegian saithe fisheries, Faroese, Russian and Norwegian Arctic cod and haddock fisheries and a North Sea plaice

and sole fishery,. He has also been a peer reviewer for numerous MSC certification reports by various Certification bodies and has also carried out two MSC pre-assessments and numerous annual audits.

In 2010 he delivered a lecture on The Importance of a Fisheries Interaction with the Ecosystem in the MSC Certification Process' at an international Safe Seas conference in Portugal.

In 2014 he successfully completed the four module MSC on line training course, passed the exam and was certified in the role of an MSC Fishery Assessment Team Leader.

Elected as a Fellow of the Society of Biology in July 2014.

2.1.2 RBF Training

The assessment team is fully trained in the use of the RBF, which was not used for this fishery assessment.

3. Description of the Fishery

3.1 Unit(s) of Certification and scope of certification sought

Acoura confirm that the fishery is within scope of the MSC certification sought for the assessment as defined.

Prior to providing a description of the fishery it is important to be clear about the precise extent of potential certification. The MSC Guidelines to Certifiers specify that the unit of certification is **"The fishery or fish stock (biologically distinct unit) combined with the fishing method / gear and practice (= vessel(s) and / or individuals pursuing the fish of that stock)"**.

This clear definition is useful for both clients and assessors to categorically state what was included in the assessment, and what was not. This is also crucial for any repeat assessment visits, or if any additional vessels are wishing to join the certificate at a later date. The units of certification for the fishery under consideration are as set out below.

The fisheries assessed for MSC certification are defined as:

Species:	Sole – solea solea
Stock:	North sea sole
Geographical area:	ICES sub-areas IVb and IVc
Harvest method:	Pulse trawl: HFK (with or without sumwing) and Delmarco (without sumwing)
Client Group:	Coöperatieve Visserij Organisatie (CVO)
Other Eligible Fishers:	Other existing and/or new trawl fishers may receive derogations in the future to convert to pulse. These would then be eligible to join the certification, if they are or become a member of CVO and sign the code of conduct for the pulse fishery. This includes flag vessels from Germany, England and/or Belgium. A rough estimation of the number of other eligible fishers is 30.

Species:	Plaice – pluronectes platessa
Stock:	North sea plaice
Geographical area:	ICES sub-areas IVb and IVc
Harvest method:	Pulse trawl: HFK (with or without sumwing) and Delmarco (without sumwing)
Client Group:	Coöperatieve Visserij Organisatie (CVO)
Other Eligible Fishers:	Other existing and/or new trawl fishers may receive derogations in the future to convert to pulse. These would then be eligible to join the certification, if they are or become a member of CVO and sign the code of conduct for the pulse fishery. This includes flag vessels from Germany, England and/or Belgium. A rough estimation of the number of other eligible fishers is 30.

Please note that whilst the Unit of Certification details the full extent of what is being assessed, it is the full and complete Public Certification Report that precisely defines the exact nature of certification for this fishery.

These Units of Certification were used as it is compliant with client wishes for assessment coverage and in full conformity with MSC criteria for setting the Unit of Certification.

3.1.1 Scope of Assessment in Relation to Enhanced Fisheries

The fisheries are not enhanced fisheries.

3.1.2 Scope of Assessment in Relation to Introduced Species Based Fisheries (ISBF)

The species under assessment are native to the North Sea and are not introduced species.

3.2 Overview of the fishery

3.2.1 CVO

Fishery Ownership

Coöperatieve Visserij Organisatie (CVO, in English the Cooperative Fishery Organisation).

History of the Fishery

The North Sea plaice fishery has been economically important to countries bordering the North Sea for well over a century. Plaice were first exploited by fleets of sailing smacks deploying small beam trawls and then towards the end of the 19th century by steam trawlers. This period saw a rapid increase in the exploited area of the North Sea as sail gave way to steam and subsequently as trawlers adopted the recently developed otter trawl (Rijnsdorp & Millner, 1996; Millner et al., 2005).

The main plaice fishery was then predominantly in the central North Sea, but in recent years it has moved to the southern North Sea as the more valuable sole (*Solea solea*) became the principal target species.

Sole has been exploited in the southern North Sea as a by-catch in demersal fisheries since the early 1900s. The modern targeted fishery for sole began in the 1960's with the introduction of large beam trawls mainly by fishermen from the Netherlands. Landings rose from less than 4000t in 1905 to a peak of 33,000t in 1966-1968 (Millner & Whiting, 1996). This level of landings represented overexploitation of the North Sea sole stock, but this has now recovered and the latest ICES advice indicates landings in 2016 of no more than 11,921 tonnes (ICES, 2015a)

Traditionally sole fisheries in the North Sea were on a seasonal basis starting in the spring as sole migrated inshore to spawn. They continued at a low level throughout the summer and increased in the autumn before sole moved into deeper water to overwinter. Catch rates were highest at night when sole are actively feeding and low during the day when sole remain partially buried in the seabed. The development of beam trawls with heavier tickler chains which disturbed the buried fish allowed fisheries to extend throughout the year and enabled sole to be caught in both daylight and at night. Sole remains an important target species for many inshore fisheries where it is caught by trawling and in fixed nets but the majority of the landings are taken by beam trawlers in mixed fisheries with plaice, dab, turbot and brill. In 2009, 69% of the sole landings were by the Netherlands beam trawl fleet, while Belgium landed around 10% mainly from beam trawling and the UK 7% from beam trawl and mixed demersal trawlers.

Traditionally plaice were taken by otter trawl, seine and gill nets but with the advent of highly efficient beam trawlers, initially mainly from the Netherlands, the plaice directed otter trawl fleets declined. Landings increased from around 40,000 to 70,000t in the period 1900-1950 and with the advent of modern beam trawls and increasing fishing effort it increased to over 150,000t by the mid 1980's. Quota and effort restrictions in the North Sea reduced plaice landings in the 1990's and 2000's to enable the stock to recover. These efforts have been successful and the latest ICES advice from June 2015 proposes landings should be no more than 159,197 tonnes (ICES, 2015b).

Most of the catch is landed into the Netherlands either by the Dutch trawl fleet or by Dutch vessels fishing on the register of other countries such as Germany and the UK. In 2010 the Netherlands fleet took 42% of the catch whilst UK vessels took 23%, landing around 85% of that into the Netherlands (ICES, 2010a). Denmark also shows significant landings, taking around 17% of the total in 2008.

Organisational Structure

The North Sea sole and plaice fishery is managed at a European Union level under the Common Fisheries Policy. Several Member State fishing nations are active in the fishery with the Netherlands holding the majority of quota and landing the highest quantities from these fisheries. The Netherlands fleet is organised into a number of Producer Organisations (PO) around the Dutch coast that manage quota, catch marketing and act as industry representatives. The CVO is a collaboration of POs and membership includes:

- Cooperative Producers Organisation and Management Group Delta ZuidU.A.

- Cooperative Producers Organisation Dutch Fishing Union UA
- Cooperative Producers Organisation and Management Group Texel UA
- Cooperative Producers Organisation and Management Group Wieringen UA
- Cooperative Producers Organisation and Management Group West UA
- Cooperative Producers Organisation for Fisheries Urk UA
- International Shrimp Producers Organisation Rousant UA

The members of the CVO cover a large part of the Dutch trawlers operating in the North Sea.

Each trawler within these UoCs holds a licence from the Ministry of Economic Affairs to fish using the pulse trawl fishing method (as further described in section 3.2.2 below).

Area Under Evaluation

The area under evaluation is the North Sea, specifically ICES subareas IVb and IVc, as shown in Figure 1.

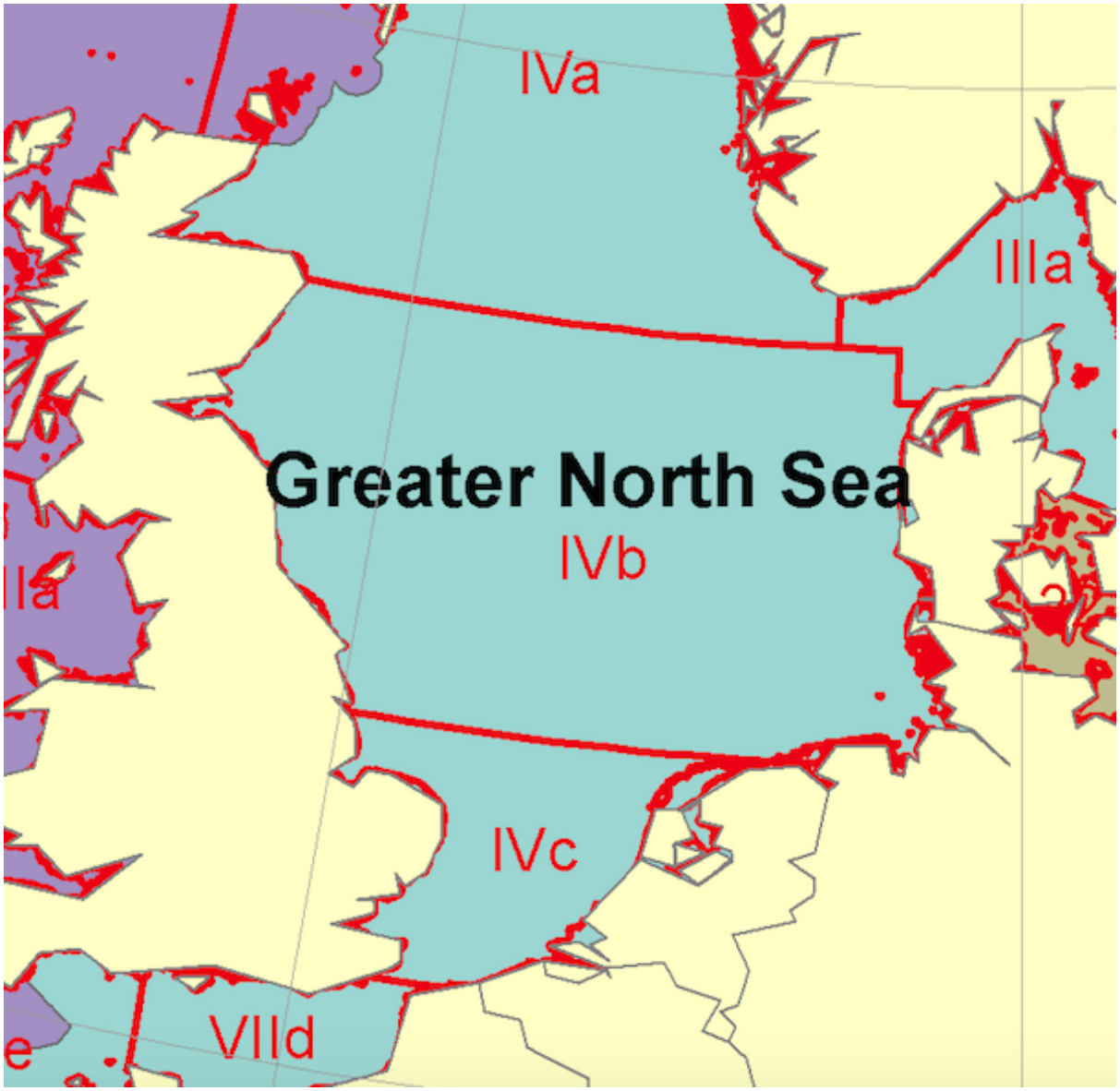


Figure 1 Map showing the Central and Southern North Sea

source: ICES

3.2.2 Species and Fishing Practice

Species type/s

The target species for the fishery under certification are sole and plaice. As indicated initially, this report does not intend to provide a scientifically comprehensive description of the species. Interested readers should refer to the references cited in the summary description of the species.

Management History

Fleets exploiting North Sea flatfish have decreased substantially in number and effort over the past ten years. This reduction is a consequence of management measures (quota and effort control) and economic pressures, particularly the increased fuel prices that made the traditional beam trawl fleet uneconomic.

The owners of the remaining beam trawlers sought to reduce fuel costs and the sumwing, a hydrofoil replacing the traditional beam, was developed and widely adopted. More recently, the pulse trawl has been developed to further reduce fuel costs and to increase selectivity. The pulse gear uses strings of electrodes towed from the beam and replacing the tickler chains to stimulate the fish out of the seabed. Pulse gear is often used in combination with the sumwing; the pulse wing gear.

In 2013 the pulse trawl fleet consisted of 42 vessels. An extra derogation from the EC for a further 42 vessels was given at the beginning of 2014 and these vessels transferred to pulse trawl during the course of 2014. Landings for the pulse trawl fishery have therefore increased in 2014. The Dutch beam trawl fleet now consists of 84 pulse trawl vessels and around 8 vessels continuing with the traditional beam.

Fishing Practices

The pulse fleet operates year-round in the North Sea, with trips generally lasting for several days before landing back to the Netherlands or other North Sea designated ports.

Some vessels use their pulse gear year round, others switch between gears. Pulse trawl vessels sometimes switch to twinrig and/or traditional beam trawl to target plaice (mainly summer months). Some Euro cutters also switch to traditional shrimp trawling. Currently there are no vessels that both operate a pulse trawl system for flatfish as well as for shrimps. There are however vessels that have a derogation that covers both target species, so it is possible that this will happen in the future.

All gear switches are evident from the electronic logbook, except for the switch between pulse trawl and traditional beam trawl for flatfish (80mm or higher). The Dutch fishery industry is working towards a separate code for the use of pulse trawling, however this has not been established yet. In the meantime, CVO will collect information on the use of gears directly from the fishermen.

With respect to pulse fishery, the CVO represents, as of April 2015, the interests of a total of 89 vessels, of which 83 are Dutch vessels and 6 are flag vessels. These flag vessels fish under the flag of the UK (3) or Germany (3) and are also members of a Dutch PO. Out of the 89 vessels associated with the CVO, 6 are not yet active. Most of the vessels fish for flatfish; 3 of the vessels fish for shrimp.

The CVO client group has a certificate sharing letter in place, see attachment 32. This is also publically available on the CVO website.

An up to date vessel list can be obtained by contacting Acoura using the following details:

MSC Fisheries Department

Contact Email: fisheries@Acoura.com

Contact Tel: +44(0)131 335 6662

Fishing gear

Research on electrical or pulse stimulation in beam trawling started in the 1970s in the Netherlands (van Marlen, 2000), and also in Belgium (Vanden Broucke, 1973), Germany (Horn, 1976, and the United Kingdom (Horton, 1984). A pulsing electric field can be utilised to catch flatfish, in particular sole, in seawater, using an array of electrodes instead of tickler chains in beam trawls (De Groot and Boonstra, 1970). Though the initial primary motive was to save fuel by decreasing gear drag, the

development stopped when fishing with electricity was banned in the European Union (EU) in 1988 (See EU Council Reg. 850/98) in view of concerns that adoption of the gear might increase catching efficiency (and fishing effort) at a time when the state of resources was worsening. In the late 1990s, the development of beam trawling with electrical stimulation resumed, focussed on reducing adverse ecosystem effects due to bottom trawling and particularly beam trawling (Van Marlen, et al., 2001). In The Netherlands, this development was taken up by a private company (Verburg-Holland Ltd.) together with RIVO, the Dutch Fishermen"s Federation and the Ministry of Agriculture, Nature Management and Food Quality.

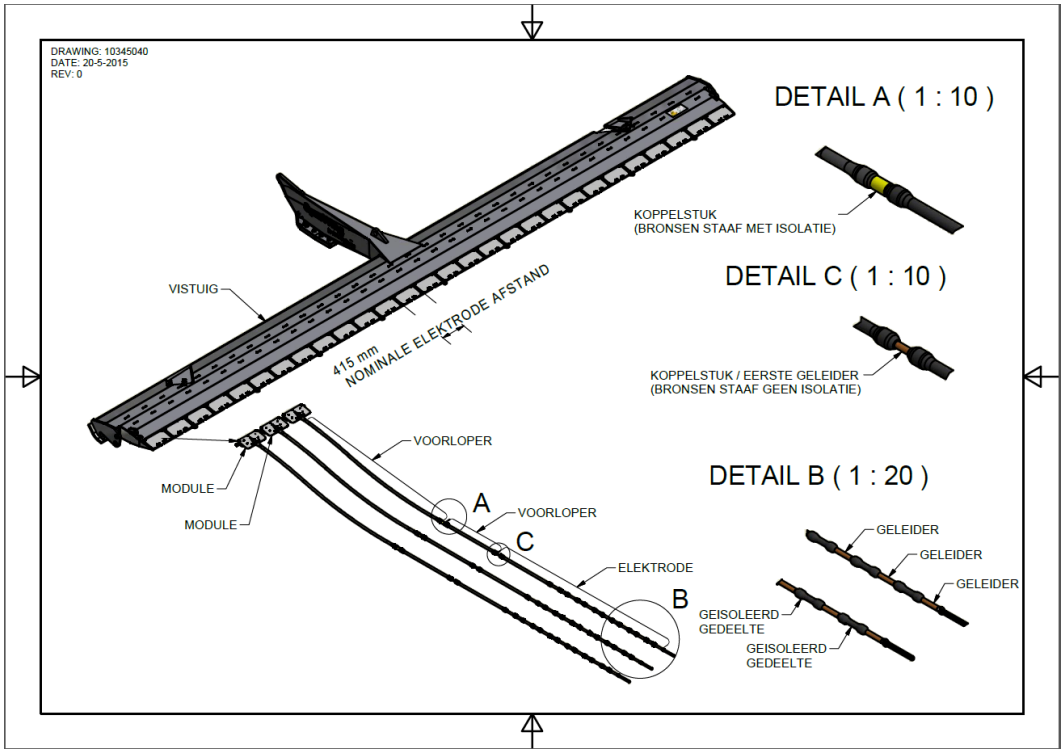
Pulse trawling is a form of fishery in which for a short period of time a limited electric field is generated above the seabed, in order to drive the sole and plaice out of the seabed. Vessels are equipped with two pulse trawls, one on starboard side and one on portside.

The pulse gear generally consists of a beam or SumWing, (between 4,5m and 12m wide), with an attached net. The electric field is situated between the beam or SumWing and the underside of the net. To generate this electric field, electrodes and pulse modules (pulse generators) are used. The pulse modules provide power to the electrodes, according to the pulse settings on board. The pulse gear is towed by a fishing line. In addition, a separate cable runs from the back of the vessel to the fishing gear to supply the pulse modules with power. When the fishing gear is released (to start fishing), the power cable automatically rolls out.

The pulse modules (pulse generators) are attached to the beam or SumWing at a distance of at least 40cm from each other. Generally, the beam or SumWing is towed about 40cm above the seabed. To focus the electric field on the seabed instead of in the water column, the first part of the electrode is therefore completely isolated. This part of the electrode is called the 'pre-runner'. Behind this pre-runner, at a distance of around 3 meters from the pulse module, the first conductive parts are present. The conductive parts alternate with isolating parts until the end of the electrode. In general, between 9 and 12 conductive parts are present on one electrode and this part has a maximum length of 4,5m. All pulse modules (and therefore the electrodes) are attached to the beam or SumWing in the tow direction of the gear.

Net: A mesh size of 80mm in the cod end is assumed[1]. The upper side of the net starts with a headrope, almost directly after the beam or SumWing, while the underside of the net only starts until after the electric field (from the footrope onwards). In many cases the footrope is attached to the beam or SumWing with pull relievers, in order to have the footrope (and with that the underside of the net) at a certain distance from the end of the electric field. Behind the footrope lies the rest of net with the cod end (Figure 2 and Figure 3).

[1] Some vessels may choose to fish with slightly larger meshes and up to 99mm permitted in the flatfish fishery according to the technical measures regulation 850/98.



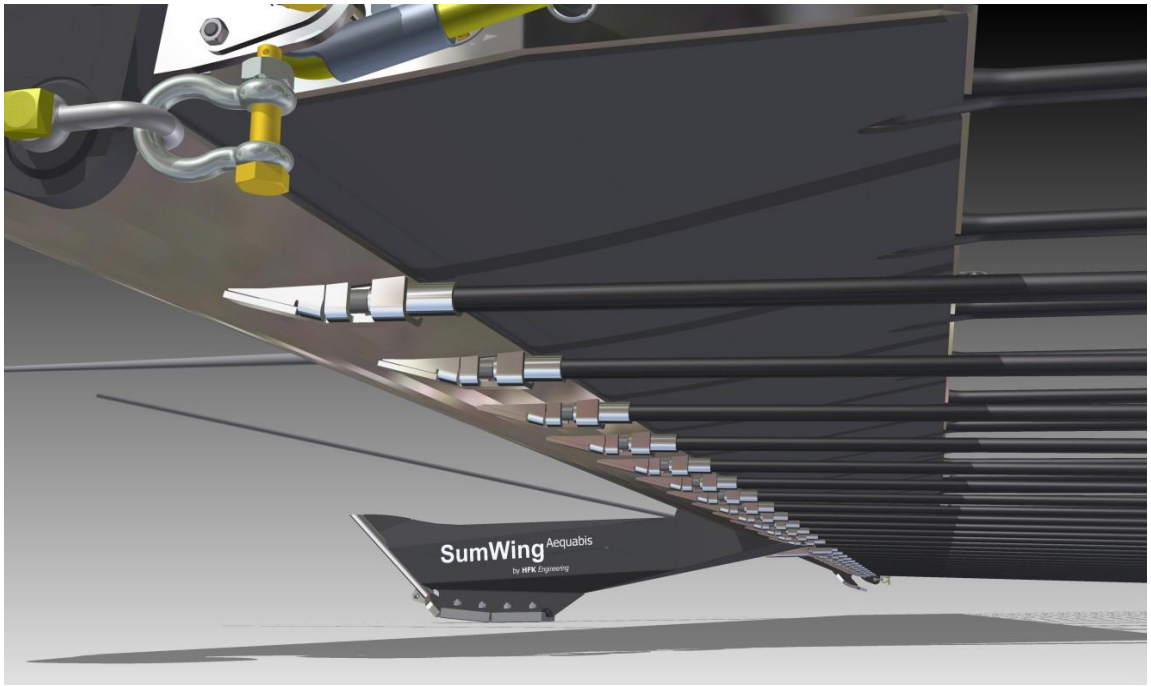


Figure 2 Schematics of a sumwing and electrodes for pulse trawling (a – showing detail of electrodes and b – view from below)

Source: HFK

Figure 3 Pulse trawl gear entering the water

Source: CVO

Two Dutch suppliers are active in the pulse fishery for flatfish. These are Delmeco (Colijnsplaat) and HFK Engineering (Baarn). As of April, the CVO represents 71 vessels with HFK gear (12 Eurocutters and 59 large cutters; 63 with SumWing and 8 without) and 13 with Delmeco gear (7 Eurocutters and 6 large cutters; all without SumWing). The gears differ slightly in design and method of data registration. However, the general description of the pulse trawl gear above applies to both gears.

Historical Fishing Levels

While the Dutch beam trawl fleet has operated for decades, the pulse fishing technique is a newly-adopted technique that can be summarised with the following timeline:

- Before 1988: research with use of electricity in fishing
- Ban on electric fishing in 1988
- Developing a pulse system (1992-2004)
- Pilot project on a commercial vessel (2004-2007)
- Study Group Pulse & SumWing (2007-2010)
- Step from innovation to implemented fishing technique (2010)
- Expanding nr. of exp. licenses 21-42 cutters (2010-2011)
- Expanding nr. of exp. licenses 42-84 cutters (2011-2014)
- 84 pulse trawl licences within the Dutch fleet (2015)

The transition to pulse by the Dutch fleet is shown in figure 4 below.

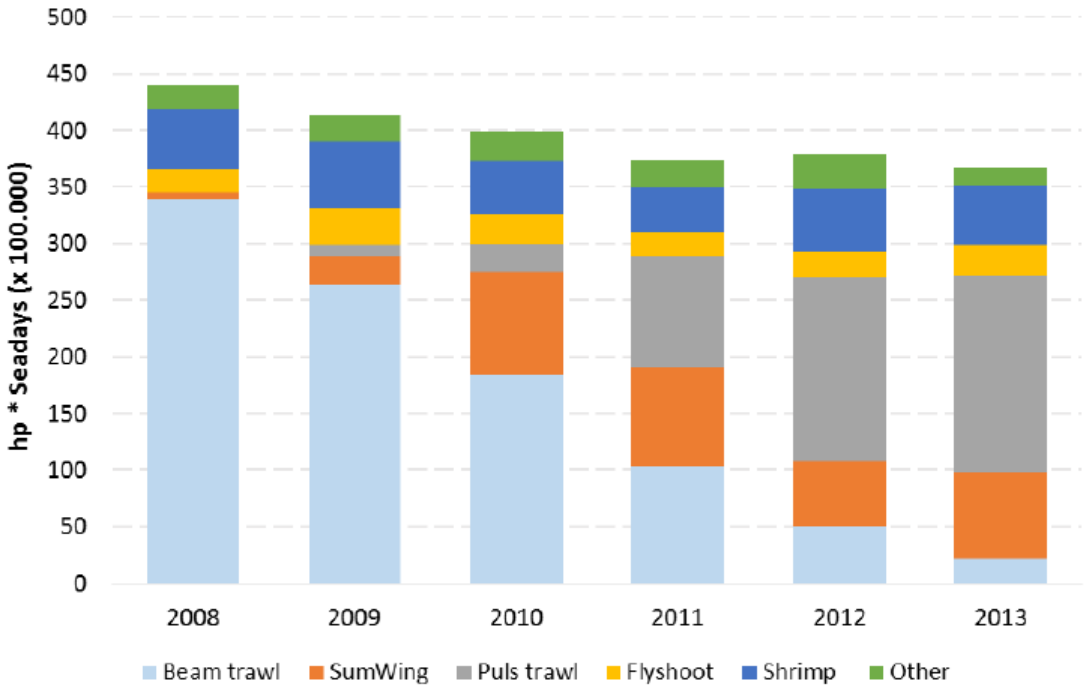


Figure 4 Transition in the flatfish fishery in the Netherlands

Source: Batsleer 2015

3.3 Principle One: Target Species Background

Principle 1 of the Marine Stewardship Council standard states that:

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.

Principle 1 covers all fishing activity on two stocks, namely the plaice (*Pleuronectes platessa*) in Subarea IV (North Sea) and Division IIIa (Skagerrak) and the sole (*Solea solea*) in Subarea IV (North Sea).

In the following section the key factors which are relevant to Principle 1 are outlined. The primary sources of information in this section are:

- EU. 2007. COUNCIL REGULATION (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Official Journal of the European Union L 157/1.
- ICES. 2014. WKMSYREF-3. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp.
- ICES 2015a. Book 6, section 6.3.31, Plaice (*Pleuonectes platessa*) in Subarea IV (North Sea and Division III (Skagerrak),13 pp.
- ICES 2015b. Book 6, section 6.3.46 Sole (*Solea solea*) in Subarea IV (North Sea) ICES stock,9 pp.
- ICES 2015c. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13.

3.3.1 Plaice

Biology of plaice

Plaice is a demersal species generally living on sandy substrates but may also be found on mud and gravel. The species is easily identified throughout its life history. As juveniles and adults, plaice have a striking appearance and can be readily distinguished from other flatfish species by their general colour and markings (Figure 5). The eyed, right hand, side is greenish-brown with bright red to orange spots on it and the underside is a pearly white. This coloration varies with the substrate into which it very lightly merges (Wheeler, 1969).

Figure 5 Plaice (pluronectes platessa)

Plaice is a shallow water species found from the near coast as juveniles down to around 150 metres in northern waters. In the North Sea it is generally found in depths less than 100 metres. The species is widely distributed on the continental shelf from the Bay of Biscay in the south through the English Channel, North Sea and Irish Sea to the Baltic, Iceland, the Norwegian coast and Barents Sea in the north. The North Sea stock comprises a complex of small sub-populations with some mixing between other populations particularly in the eastern English Channel (VIId) and in the Skagerrak (IIIa). Sub-populations in the North Sea have a strong homing behaviour to specific spawning grounds (De Veen, 1978; Rijnsdorp and Pastoors, 1995; Hunter et al., 2003; 2004).

The biology of plaice has been extensively studied for over one hundred years and there is a considerable fund of knowledge about all aspects of its life history (Gibson, 2005). The spawning behaviour, location of spawning and the nursery grounds are all well described throughout the species range (Masterman, 1911; Simpson, 1959; Rogers et al., 1998; Fox et al., 2005; Taylor et al., 2007). Fecundity varies from around 30,000 eggs per female at first maturity to over 300,000 eggs depending on age. A 35 cm female produces between 60,000 – 100,000 eggs per year or about 265 eggs per gram body weight. Fecundity has been shown to change noticeably over time (van Damme et al., 2008) possibly in relation to changes in stock abundance (Rijnsdorp, 1991). Male fish mature at around 2 to 3 years old whilst female fish mature a year or two later. In recent years there has been a change, with maturity occurring at younger ages and smaller sizes than in the past. This is thought to be partially a fisheries induced genetic change caused by fish which are genetically programmed to mature later at a larger size being caught before they have the opportunity to reproduce and pass on their genes (Grift et al., 2007).

Spawning and nursery areas in the North Sea are particularly well described and have changed little since studies began (Masterman, 1911; Simpson, 1959; Harding et al., 1978; Fox et al., 2005; Taylor et al., 2007). The principal spawning areas are in the eastern English Channel and the southern Bight of the North Sea. Although plaice eggs can be found in most shallow areas of the North Sea, they are at lower concentrations as one moves north (Fox et al., 2005). Prior to spawning there is some movement of fish between the southern North Sea and eastern Channel. Spawning begins in December in the southern North Sea and English Channel and continues through to March and April further north. The eggs are planktonic, around 2 mm in diameter, and are easily distinguished, due to their large size, from other eggs present in the plankton at the same time. The larvae are also easily distinguished from other fish larvae by their general shape, size and pigmentation (Nichols, 1971; Russell, 1976). Larvae hatch in about three weeks and begin feeding almost immediately on phytoplankton, *Oikopleura* spp., *Frittillaria* spp., copepod nauplii and other invertebrates (Last, 1978, 1980; Ryland, 1964). During the planktonic phase, which lasts two to three months, the eggs and larvae are subjected to the residual drift which, in the southern North Sea, transports them to the shallow nursery areas along the continental coast and into the Wadden Sea, German and Danish Bights and east coast of the UK. During the larval drift period both eggs and larvae suffer high rates of mortality, estimated at around 80% per month (Bannister et al., 1973), but the precise causes of that mortality are not well understood. Starvation of early larvae has been studied (Shelbourne, 1957) but predation is likely to be the most important factor (Bunn et al., 2000; Daan et al., 1985; van der Veer, 1985).

Plaice recruitment to the stock is mainly determined during the egg and larval phase and is driven by environmental factors such as sea temperature, predation, and drift of larvae to suitable nursery areas. In the final phase of planktonic development, the larvae metamorphose into flatfish with the migration of the left eye onto the right side and the development of dark pigmentation on the eyed side. They then spend their first year in the shallow coastal areas followed by a gradual offshore migration, into deeper water with age (Gibson et al., 2002). In recent years, plaice distribution has changed and juveniles are not found so abundantly in the inshore nursery areas in the eastern North Sea (Beare et al., 2013).

Although the Wadden Sea is especially important as a nursery area (Kuipers, 1977; Zijlstra, 1972), settling plaice can be found on most sandy and sandy/muddy beaches around the North Sea coastline (Harlay et al., 2001; Rauck, 1974; Rogers et al., 1998) including the Thames estuary and the Wash. The nursery areas on the eastern side of the North Sea contribute most of the total recruitment (ICES, 2010a). At the time of settlement the small plaice are subjected to predation, mainly by the brown shrimp, *Crangon crangon* (van der Veer & Bergman, 1987). Overall, post settlement mortality during the first year of life, the‘0’ group phase has been estimated at about 40% per month (Bannister et al., 1973) and acts as a dampening mechanism so that variability in survivor

numbers at the end of the nursery ground phase is reduced compared to the variability in numbers settling (Beverton & Iles, 1992).

The diet of post-settlement plaice is well known being dominated by polychaetes, crustaceans and molluscs (Amara et al., 2001; Thijssen et al., 1974). Post-settlement plaice may also 'crop' bivalve siphons without killing the prey (de Vlas, 1979; Lockwood, 1980). During the juvenile phase mortality rates gradually decline to around 10 - 20% per month during their second year as '1' group fish (Bannister et al., 1973) [Note; Plaice in common with most other northern hemisphere teleost species have a nominal 'birthdate' of 1st January and will therefore remain as '0' group fish until 31st December after which they become '1' group fish]. The main predators switch from *Crangon* to shore crabs (*Carcinus maenas*) and fish as the juvenile plaice grow (Beverton & Iles, 1992). During the late summer and autumn, the juvenile plaice gradually move into deeper water. A portion of 1 group and even 2-group fish may return to shallow waters in successive years, particularly in productive areas like the Wadden Sea (Kuipers, 1973). These fish may exert an element of cannibalism on the younger fish in the area but this does not appear to have been well studied (Kuipers, 1977). Adult plaice feed on a wide variety of demersal organisms. They feed on larger molluscs including *Mactra* small scallops and razor shells, worms including *Aphrodite*, small crabs, brittle stars (*Ophiura* spp.) and even small fish such as sandeels.

There is some evidence that plaice diets may have changed over time since bivalves appeared to be more important in studies conducted in the early 20th century (Todd, 1905; Todd, 1907; Todd, 1915). This may reflect a long-term reduction in bivalve abundance in the southern North Sea, perhaps due to beam trawling (Callaway et al., 2007; Frid et al., 2000; Rumohr & Kujawski, 2000) although changes in nutrient loading and oceanography have also occurred in this region (Jennings & Kaiser, 1998). Rijnsdorp et al., (2001) examined plaice stomach contents inside and adjacent to the plaice-box protected area but no consistent differences in diet were detected between these locations.

Stock Structure

Although there is a single management unit covering the whole of ICES subarea IV there is known to be migration both between the North Sea and the Skagerrak (ICES division IIIa) and between the North Sea and the eastern Channel (ICES division VIId). In the Skagerrak, plaice migrate from the North Sea and mix with a component of western Skagerrak plaice, resulting in a fishery on the summer feeding grounds (Ulrich et al., 2013; WKPESTO, 2012). As a result, in 2015, ICES decided to include the western Skagerrak component in the assessment as part of the wider North Sea stock (ICES, 2015c).

A similar migration of plaice from the North Sea occurs into the eastern Channel but mainly in the first quarter. Tagging data has shown that there is a spawning migration between the North Sea and the eastern Channel in December and January involving between 13% and 30% of the plaice from the southern Bight (Hunter et al., 2004a, b; WKFLAT, 2010). As a result, part of the catches in the VIId area in the first quarter have been included in the North Sea plaice assessment. In 2015, 50% of the mature animals from VIId in Q1 were added to the North Sea stock, whereas in assessments before this, 50% of the total catches were added. In addition, since 2015, 50% of the mature discards in Q1 have also been added to the North Sea stock.

Stock status, North Sea including Skagerrak

i) Spawning Stock Biomass

The trend in the spawning stock biomass is shown in Figure 6. The stock declined sharply during the 1990s from a peak of over 480,000t in 1987 and fluctuated around or just below B_{pa} (the level of spawning biomass that should avoid recruitment failure with a high degree of certainty) of 230,000t during a number of years in the period 1994-2004. In recent years the stock has shown a strong recovery and the SSB at the start of 2016 is estimated at about 957,000t by ICES (2015a). This is a record high level for the stock and 6 times the level at which recruitment is considered to be impaired (B_{lim}). The increase in the stock has occurred under average recruitment conditions and is not caused by a higher productivity of the stock. The main reason for the increase is considered by ICES to be the reduction of fishing mortality under the present management plan. Recent estimates of SSB_{msy} by

ICES (ICES, 2014) indicated a range of 868,627 to 2,057,367. Current estimates for the combined plaice stock of 957,000t imply that the stock is fluctuating around B_{msy}.

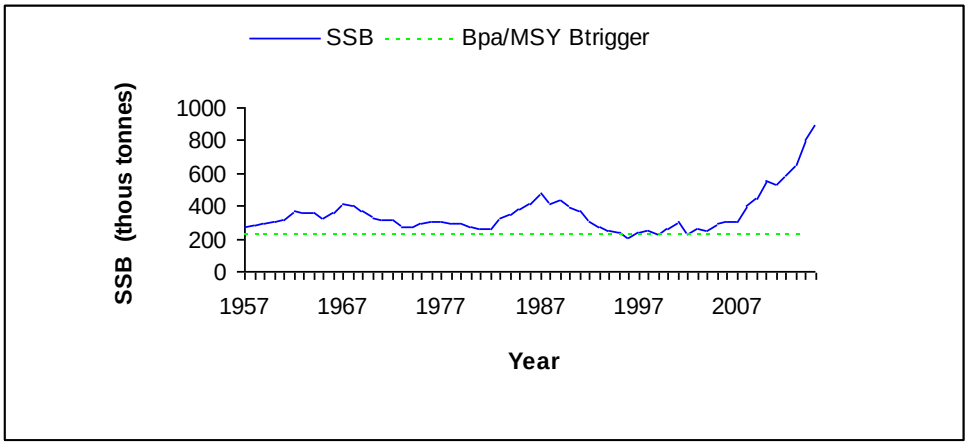


Figure 6 Spawning Stock Biomass (SSB) of North Sea plaice for 1957 to 2015 with precautionary reference levels Bpa shown (source: ICES, 2015a)

ii) Fishing mortality

Total fishing mortality which includes both human consumption and discard mortality increased over the forty-year period up to 1997 after which it started to decline with the exception of a brief increase between 2001 and 2003 (Figure 7). Since 2003 it has decreased considerably reflecting the reduction in effort by the fishing fleet. It is estimated to have fallen below the precautionary reference level (F_{pa}) of 0.6 since 2005 and to be below the long-term management objective of F=0.3 since 2008. In the past 7 years, fishing mortality has been estimated to be within the range of F_{msy} (0.13- 0.27) and to be below the point estimate of 0.19 in 2013 and 2014.

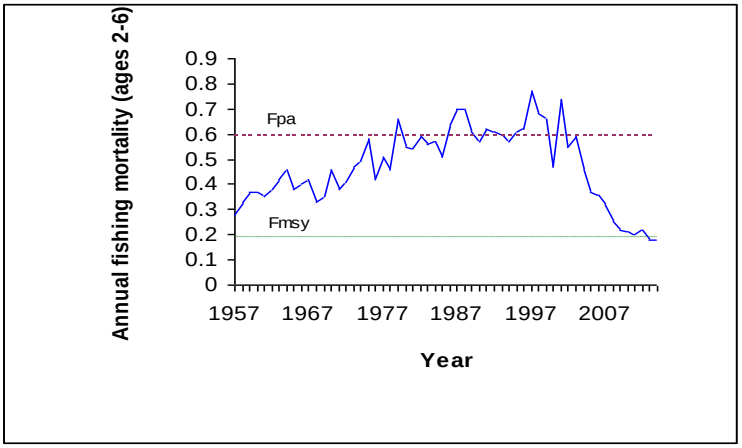


Figure 7 North Sea plaice total fishing mortality for landings plus discards. The precautionary reference point (F_{pa}) and F_{msy} are based on total mortality (source: ICES, 2015a).

iii) Recruitment

Figure 8 shows the changes in recruitment of juvenile plaice at age 1 into the stock over the period 1957-2015. There was an increase in recruitment during the 1980s with the 1985 year-class being the largest recruitment in the time series and with other strong year classes in the 1980s including, 1981, 1984, 1986 and 1987. The strong recruitment led to a temporary increase in stock abundance despite the high level of fishing mortality. During the early 1990s, the stock declined rapidly following

a period of poor recruitment apart from in 1996 and 2001 and under continuing high fishing pressure. In recent years, recruitment has varied around the long term average of around 1 billion. At the same time there has been a very strong stock recovery which implies that it has been driven mainly by the reduction in fishing mortality rather than by strong recruitment.

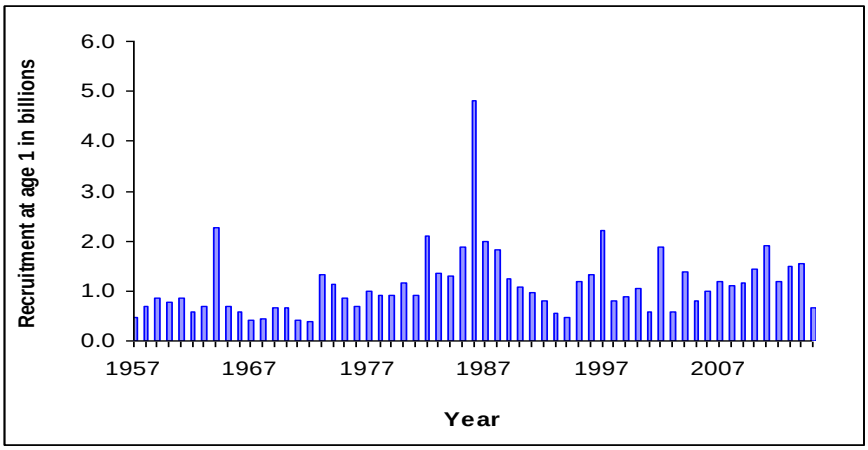


Figure 8 Recruitment of North Sea plaice at age 1 in billions (source: ICES, 2015a)

iv) Stock-Recruitment relationship

Figure 9 shows the relationship between spawning stock biomass and recruitment at age 1. The scatter of points implies that there is no strong relationship between the size of the stock and recruitment over a wide range of stock abundance. There is also no clear breakpoint at which recruitment appears to be impaired.

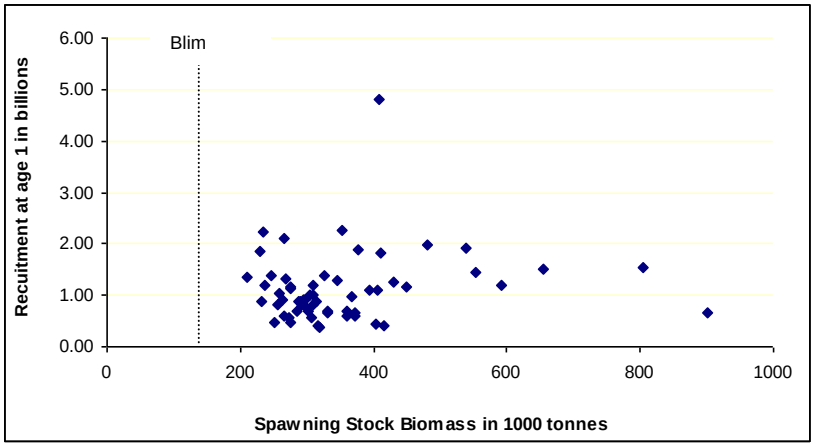


Figure 9 Relationship between the size of the spawning stock and number of recruits at age 1 (source: ICES, 2015a)

v) Catch and Landings

The trend in catch (landings plus discards) between 1957 and 2014 is shown in Figure 10. Landings in 2014 from the combined North Sea and Skagerrak were 80,686t from a TAC of 121,687t. Discards have been a high proportion of the total catch, and in 2014, ICES estimated that 52,937t were discarded.

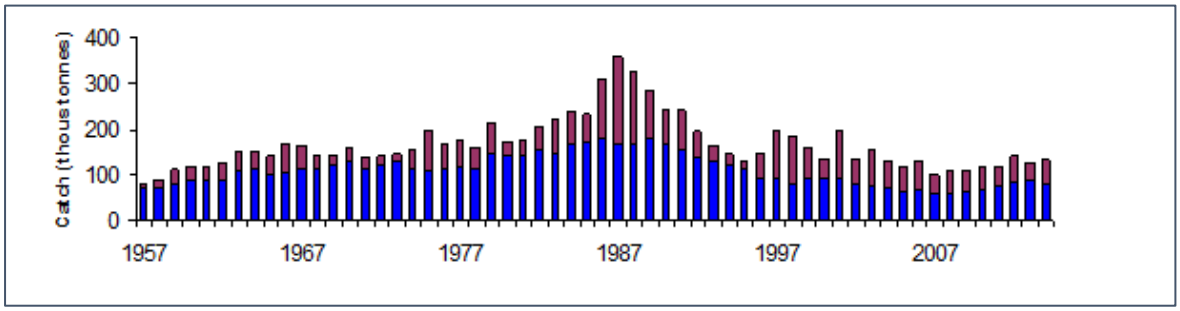


Figure 10 Landings (blue) and discards (red) of North Sea plaice in thousands of tonnes (source: ICES, 2015a)

Biological Reference points

Biological reference points showed below for North Sea plaice were established in 2004 when discard estimates were included in the assessment for the first time and are shown below (ICES, 2015a). Although the stock includes the component from the Skagerrak, the biological reference points are based on the North Sea stock only and have not yet been revised.

F_{lim}	0.74
F_{pa}	0.60
F_{msy}	0.19 (range 0.13-0.27).
B_{lim}	160,000 t
B_{pa}	230,000 t

Limit Reference Points

Limit reference points for biomass are regarded as the minimum level above which biomass should remain in order to prevent recruitment being impaired. As there is no clear breakpoint in the relationship between stock and recruitment for plaice, the limit reference point for biomass, B_{lim} was set at 160,000 t as the lowest biomass that had produced average recruitment based on figures in 2004. The limit reference point for fishing mortality, F_{lim} is defined as the exploitation level that would lead to the stock falling below B_{lim} in the long term. ICES estimated F_{lim} as 0.74. Spawning Stock Biomass is estimated to be at an historically high level in 2016 and nearly 6 times the level of B_{lim} and this gives considerable confidence that it is above the level where recruitment would be impaired.

Precautionary Reference Points

In order to safeguard against the stock falling to B_{lim}, a more precautionary reference point was established by ICES which takes some account of the uncertainty in estimating biomass and fishing mortality. These reference points were defined as the precautionary points and were set to provide a buffer to reduce the probability of the stock falling to B_{lim}. The precautionary reference point for biomass, B_{pa} was set at 230,000t, using a default multiplier of 1.4 from B_{lim} as this was considered to afford a high probability of maintaining SSB above B_{lim}. The precautionary reference fishing mortality, F_{pa}, defined as the fishing mortality that in the medium term should ensure that the SSB would be around B_{pa}, with a 50% probability, was set as 0.6. SSB has been well above B_{pa} since at least 2005.

Maximum Sustainable Yield Reference Points

In 2010 ICES implemented the MSY framework for providing advice on the exploitation of stocks. The aim was to manage all stocks at an exploitation rate that is consistent with maximum long term yield while providing a low risk to the stock. Initially, following a detailed analysis which took into account the uncertainty in the stock recruit relationship for plaice, F_{msy} was estimated at 0.25 and ICES considered that any value of F between 0.2 and 0.3 would result in high long term yields and low risk

to the stock (Simmonds et al., 2010; ICES, 2011). However, following a request from the European Commission for further advice on F_{msy}, a workshop was held to re-evaluate the range of F_{msy} for a number of stocks. In the case of plaice, the workshop revised the point estimate for F_{msy} from 0.25 to 0.19 and the range comprised between 0.13 and 0.27 (ICES, 2014). This has implications for Management Targets as the point estimate for management of F=0.3 under the EU Multiannual Management Plan (MAMP) is no longer within the range estimated for F_{msy} (see section below).

Management Target Reference Points

As part of a long term management plan for plaice and sole in the North Sea a target fishing mortality F_{MP} was agreed for plaice at a rate equal to or no lower than 0.3 on the basis that this would result in the highest yield from the stock in the long term (ICES, 2005a). The target fishing mortality was consistent with ICES advice on F_{msy} which indicated that "the stock should be considered to be sustainably fished (e.g. in stock status tables) for any F on the range 0.2-0.3", (ICES, 2012a). However, in 2014 a re-evaluation of advice on F_{msy} ranges was requested by the EU as part of its plans to develop long term plans for mixed species in the North Sea. In order to be consistent with the ICES precautionary approach the upper bound of the range was capped, so that the probability of SSB< Blim is no more than 5%. On this basis, ICES estimated a new value for F_{msy} of 0.19 and a range for F_{msy} of 0.13 – 0.27. This range is below the F_{MP} 0.3 and so there is an inconsistency between the management target and the current ICES advice on sustainable fishing at F_{msy} for plaice.

Harvest Strategy and Harvest Control Rules

i) Harvest Strategy

The harvest strategy for plaice is based on an EU Multiannual Management Plan (MAMP) for the management of both plaice and sole stocks (Council Regulation (EC) No. 676/2007). The plan entails a two stage process for managing the stocks. Firstly, by returning the stocks to within safe biological limits (Article 3) and in the second stage to exploit the stocks at MSY (Article 4).

The requirements for stage one have been met since plaice has been within safe biological limits since 2005 and in terms of F since 2008. The implementation of the second stage was not initially defined and until 2014, plaice was managed under transitional arrangements based on the long term management target of F=0.3 within the constraints that the TAC should not vary by more than 15%. Although the EU agreed to a full implementation of stage two of the plan in December 2014, the TAC for 2015 continued to be set on the basis of F=0.3 with a constraint of 15% on the TAC compared to the previous year.

In addition to the strategy set out in the MAMP, a range of technical measures, effort control and closed areas are also used including:

1) There is a minimum landing size of 27cm (Total Length) for fish caught in IVa, IVb and IVc except in the Norwegian sector of IVa where the size is 29cm (Total Length).

2) South of the area largely defined by 56^0 30N the permitted mesh size for towed gears is 80mm to allow fishing for sole in a mixed plaice and sole fishery. To the north of this the minimum mesh size is 100mm. In both cases, vessels have a cod by-catch limit of 5% by weight of the total catch. Most twin-rig vessels fishing north of 56^0 30N use mesh sizes in excess of 115mm to minimize discards of plaice and reduce the amount of benthos caught. In the Norwegian sector mesh size is generally above 130mm.

3) Closed areas operate within the 12nm zone from the coast where no fishing is permitted for vessels >300 HP and in the Plaice Box a protected area for juvenile flatfish which extends from 53^0N on the Dutch coast up to 57^0N on the Danish coast.

4) Effort restrictions have applied to vessels fishing for flatfish in the North Sea as a result of the EU MAMP which set targets for reductions in fishing effort by beam trawlers greater than 300HP and also as a result of regulations to protect cod. Under the recovery plan for cod, effort was managed by restricting kW-days at sea. The combination of effort regulations and economic factors has resulted in a large reduction in overall effort. For beam trawlers which make up the largest fleet segment, effort has decreased by 65% since its peak in 1998 (ICES, 2014). There are also restrictions on effort

based on beam length. The maximum beam length permitted is 24m offshore and within the 12nm zone beam length is restricted to 9m.

ii) Harvest Control Rules

The harvest control rules are defined by the MAMP and set out how the TAC should be determined in relation to precautionary reference points and the long term management reference point. In the first stage, the procedure for rebuilding the stocks to within safe biological limits are set out in Article 3 by reducing fishing mortality on plaice by 10% each year with the constraint that the TAC should not be allowed to vary by more than 15% per year. In the second stage, the objectives of the multiannual plan are to ensure exploitation of the stocks of plaice and sole on the basis of maximum sustainable yield. The procedure for setting the TAC in this stage is defined in Article 7:

> *1) The Council shall adopt the TAC for plaice at that level of catches which, according to a scientific evaluation carried out by STECF is the higher of : a) that TAC the application of which will result in a 10% reduction in fishing mortality rate in its year of application compared to the fishing mortality rate estimated for the preceding year.; b) the TAC application of which will result in the in the level of fishing mortality rate of 0.3 on ages two to six years in its year of application.*
>
> *2) Where application of paragraph 1 would result in a TAC which exceeds the TAC of the previous year by more than 15%, the Council shall adopt a TAC which is 15% greater than the TAC of that year.*
>
> *3) Where application of paragraph 1 would result in a TAC which is more than 15% less than the TAC of the preceding year, The Council shall adopt a TAC which is 15% less than the TAC of that year.*

The HCRs have been effective along with the reduction in overall effort in the fleets in achieving exploitation of plaice at or below the long term management target F=0.3. The second stage of the MAMP clearly sets out procedures for ensuring F remains around F_{msy} and requires that F is reduced by 10% annually if F moves above F=0.3. It is implicit in this approach, that if SSB were to fall once again outside safe biological limits, F would continue to be reduced annually by 10% subject to the 15% TAC constraint. The MAMP does not clearly set out rules that would apply if the stock were to continue to decline towards limit reference points where recruitment might be impaired. The only provision for this eventuality is provided for under Article 18 of the MAMP which deals with Special Circumstances. This gives the Council of the EU, on the basis of advice from its scientific experts, the power to set a lower TAC not constrained by the 15% rule and allows it to determine a greater reduction in fishing mortality than the 10% applicable under the MAMP rules, provided these changes are agreed by a qualified majority of the Council.

iii) Management Advice for 2015

The agreed TAC for 2015 was 128,376t based on the F_{MP} of 0.3 but constrained by maximum increase in TAC of 15% compared with the previous year. This was expected to lead to an SSB of around 750,000t in 2016.

The TAC advice from ICES for 2016 was for a combined TAC for the North Sea and Skagerrak. If the advice follows the long term management F of F0.3 with a constraint of 15% on the TAC, this would result in a combined TAC of 159,197t and SSB in 2016 of 940,500t. If the advice follows the MSY approach with no constraint on the TAC compared with the previous year, the TAC would be set at 106,231t and an estimated SSB of just over a million tones.

Data Collection

North Sea plaice is one of the most heavily studied stocks in the eastern Atlantic with fishery data collection extending back to the late 1800s and a full age based assessment time series available from 1957. Since 2004 the assessment has also included numbers at age of discards as well as retained fish.

Approximately 63% of the total landings weight are sampled. Landings data are split by sex separately for the Netherlands and Belgium (accounting for 50% of the landings) using sex ratios obtained during market sampling and sex combined for all other countries. Age, length and maturity data are collected by the Netherlands, France, Germany, Denmark and Belgium. Sampling levels are currently considered to be satisfactory. Discards form a substantial part of the total catch particularly in the North Sea beam trawl fishery targeted at sole. The proportion of plaice discarded in this fishery has increased considerably since the 1970's and is now estimated to be around 80% by number and over 50% by weight (van Reijden, 2014). Discard estimates are based on observer programs in the Dutch, UK, German and Danish fleets for 2000-2014 and from Belgium for more recent years. Prior to that, a reconstructed discard series for 1957-1999 is used (ICES, 2005b). Since 2004 a 'self-sampling' program for discarding has also been in operation within the Dutch beam trawl fleet that provides valuable additional data on spatial and temporal trends in discarding. The program was improved in 2009 and 2010 by comparing the data with observer trips and from 2011, Dutch discard data has come from self-sampling trips alone which has greatly extended the coverage in area and gear types. In 2013, a total of 132 trips were sampled by the program including 9 trips in vessels using demersal otter trawl 70-99mm mesh and 13 with demersal otter trawl using 100-119mm gear. The discard data was considered by ICES in 2014 to be robust and consistent from year to year.

For the first time in 2015, landings and discard estimates from the Skagerrak were included in the assessment. Landings from the Skagerrak generally amounted to less than 15% of the total from area IV in the North Sea.

Natural mortality is set at 0.1 for all ages whilst maturity is set at 0.5 for ages 2 and 3 and fully mature from age 4 onwards. In the assessment of the stock these values are assumed to be constant over time because incorporation of historic changes has been shown to have little effect on the estimation of SSB which is used to assess biological sustainability.

Fishery independent information in the form of CPUE (Catch Per Unit Effort, the quantity of fish caught by a standard amount of fishing effort) data is available from three separate research vessel surveys. The RV surveys generate age disaggregated tuning indices which are currently used in the stock assessment process to calibrate the assessment. Surveys consist of two Dutch research vessel surveys using an 8m beam trawl with 40mm mesh cod end. One survey, begun in 1985 covers the south-eastern part of the North Sea (BTS-Isis) and the other, started in 1996, covers the central North Sea (BTS-Tridens). Up to 2001 both surveys were used as tuning indices for plaice age groups 1-4 but since 2001 age groups up to 9 have been included. In 2015, the BTS-Isis survey was used separately up to 1995 and a combined Isis and Tridens survey used from 1996-2014. A third Dutch survey (SNS) is carried out in September/October using a 6m beam trawl with 40mm mesh cod end. This survey is targeted at juveniles, with transects perpendicular to the coast. It provides a time series of tuning data back to 1990 for plaice ages 1-3 for the assessment and a '0' group index for the estimation of recruitment.

Additional coastal surveys are conducted by a number of countries and a combined international index used for estimating recruitment of plaice at age 0 and 1. Commercial LPUE (Landings Per Unit Effort) data from the Dutch beam trawler fleet and the UK beam trawler fleet up to 2002 (excluding flagged vessels) are also available to the Working Group but are currently only used in exploratory analyses of the data and not in the final assessment.

Stock assessment method

Assessment of North Sea plaice is carried out by the ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). Prior to 2007 the Working Group met annually, in September each year, and their assessments were reviewed and endorsed subject to any changes, by the ICES ACFM (now ACOM) at their meeting in October. The Working group now meets in May which allows their assessments and report to be reviewed and endorsed at the May meeting of ACOM. The assessment uses official national landings data which is recorded by all countries participating in the fishery, and reported to ICES, together with the total landings estimated by the Working Group. Estimated landings for 2014 for the North Sea and Skagerrak were 80,686t compared with 86,222t the previous year and were 34% below the combined TAC of 111,631t.

The assessment is regularly reviewed through benchmark workshops carried out to evaluate the robustness of input parameters and models used in the assessment, including most recently in 2015

(WKPLE, 2015). In addition, there have been numerous reviews of key parameters such as precautionary reference points (ICES, 2004), stock identity (ICES, 2012b) and MSY reference points (ICES, 2014) as well as analysis of alternate assessment models such as Aarts and Poos (2009) who reviewed a statistical catch at age model.

The assessment model used for this stock is an aged based model, the extended survivors analysis (XSA), using landings and discards, calibrated with three fishery independent, survey indices. The XSA model has been used within ICES as an important tool for catch-at-age analysis for most demersal stocks. Careful consideration is given by the WG each year to the appropriateness of all aspects of the model parameters in relation to each species. In addition, in 2010, a statistical catch at age model (SCA) developed by Aarts and Poos (2009) was used alongside XSA. This model has the advantage that it includes data on landings and discards separately and allows for observational errors on those and other data sources. The output from this model provides SSB estimates with 95% probability bounds around the median and gave similar trends in stock abundance and mortality to the conventional XSA approach.

The output from XSA shows a slight historical bias with F in previous years being overestimated and SSB underestimated compared with the current year. This retrospective pattern is considered by the WG to be driven by differences in the trends in abundance in the survey time series as well as previously by uncertainty in discards estimates. Splitting the survey time series in recent years has reduced the bias and the trends in both SSB and mortality were similar in 2015 to previous assessments in 2013 and 2014. The improvement in the level of sampling of discards and availability of 13 years of discard samples has also helped to reduce variability in the retrospective patterns in recent years.

The addition of Skagerrak plaice into the assessment for the first time in 2015 has not affected the trends in biomass, fishing mortality or recruitment but has resulted in an overall increase in stock abundance of around 20% in recent years.

Key Low Trophic Level Species

The assessment team has considered the status of the target species with respect to the criteria for determining “Key Low Trophic Level” species set out in the MSC FCR Annex SA 2.2.9. We conclude that the target species plaice is a predator of small fish and benthos and is not a key lower trophic level species.

3.3.2 Sole

Biology of sole

The common sole, Dover sole, or black sole (*Solea solea*) is a species of flatfish in the Soleidae family (Figure 11). The small eyes are close to each other on the right side of the body. This gives the fish the possibility of lurking half-buried in the sand for passing prey.
Sole is a widely distributed species, extending from the Mediterranean and Northwest African coast, as far south as Senegal, to the Irish Sea, southern North Sea and Skagerrak and Kattegat (Figure 3.3.2.1.2). In autumn, triggered by falling temperatures, sole leave the shallow inshore waters and migrate to warmer offshore grounds (this represents the end of the fishing season for the fishery under assessment). In severe winters sole populations may form aggregations in deeper, less cold parts of the North Sea and English Channel. Spawning occurs in spring, peaking in May, triggered by rising sea water temperatures. Although it has been shown that spawners return to the same spawning grounds each year, it is not known whether recruits return to the grounds where they were born. Females are batch spawners producing on average around 350,000 eggs (35cm fish) per year. Sole are nocturnal and olfactorial feeders, spending the day buried in the sediment. The blind side othe sole has sensory organs to detect prey. Sole feed on polychaete worms (*Arenicola marina*, *Lanice* spp. and *Nereis* spp.), molluscs and small crustaceans. During the short pelagic phase, larvae feed ocopepod nauplii.

Figure 11 sole (solea solea)

The largest fisheries occur in the North Sea but there are also important fisheries in the Irish Sea, Skagerak and Kattegat and throughout the English Channel and off the French Atlantic coast as far as the Bay of Biscay. In the North Sea and Channel, sole show a seasonal migration. During summer adult soles are most abundant in waters down to about 40m depth but as temperatures fall in the autumn and winter they migrate out into deeper, warmer water.

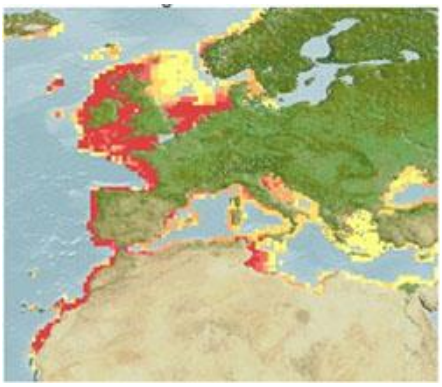


Figure 12 Distribution of sole (in red) (Source: fishbase)

Spawning begins in late winter and spring, starting in more southerly latitudes first. It peaks in the Bay of Biscay in March and in the southern North Sea in late May. In the North Sea the onset of spawning is triggered by the increase in seawater temperature (ICES, 1965). Extensive egg surveys carried out in 1984 and 1985 in the North Sea and English Channel showed that the sole in these areas migrate inshore to spawn from the over-wintering grounds in deeper, warmer water (ICES, 1986). The main spawning areas identified were in the German and Danish Bight of the North Sea, off Texel, the Thames estuary, off the Belgian coast, off the Bay of the Somme and off the English south coast from Dungeness to Selsey Bill. Sole produce a planktonic egg about 1.2mm in diameter with numerous oil globules. The larvae hatch after 5 days at 15 degree increasing to around 15 days at 7 degrees (Riley, 1974). The planktonic larval phase lasts for a further three to four weeks, depending on sea temperature. During this time, they have been subjected to the residual drift and will generally metamorphose and settle on the seabed close inshore.

The nursery areas are also close inshore with the ‘0’ group fish spending the first few months of their life history in very shallow water often close in to the beach in the surf zone and even inside some of the large harbour areas on the south coast of England. These nursery areas are characterised by a sandy or muddy substrate.

There is some evidence, from tagging juvenile sole, to suggest that there are separate spawning populations related to the different spawning areas (ICES, 1965). These studies have shown that each spawning population is mainly supplied by recruits from the nearby nursery area. Pawson (1995) states that sole undertake their most extensive migrations as maturing juveniles but once mature their movements appear to be relatively restricted. Tagging results indicate that a proportion of the southern North Sea sole move into the eastern Channel for the winter (Pawson, 1995). For assessment purposes, the sole population in the North Sea is considered to be a separate unit and

although there may be some movement between the North Sea and eastern Channel, the effect of this exchange is likely to be very small for North Sea sole (ICES, 2010b).
Regional differences in fecundity were noted in a study in 1991 with the lowest values of about 500 oocytes per gram (female body weight) in the south-western areas, reaching almost twice that level in the eastern North Sea. Millner et al (1991) also noted significant differences in fecundity between areas and across years. These differences were explained largely by weight or a combination of length and condition index at spawning time.
Recruitment variability in the sole stocks of the northeast Atlantic has been the subject of much discussion and research. The greatest variability is in the North Sea and much of that can be linked to the production of very good year classes after exceptionally cold winters, such as those in 1947, 1963 and 1987. However, the causal link with temperature per se is not established and winter temperatures only explain a part of the variability. Between spawning populations, the level of recruitment appears to be related to the surface area of the nursery grounds available (Rijnsdorp, et al., 1992). Recent research seems to suggest a link with the temperature at the beginning of the spawning period. As with many other marine species, recruitment is probably determined over the 3-4-week period that sole larvae are present in the plankton where larval mortality rates range from 10-50% per day (Horwood, 2001).
Adult and juvenile sole are higher level trophic feeders, feeding mainly on amphipods, worms and bivalves (de Groot, 1971; Mao, 1986; Lagardère, 1987; Cabral, 2000; Rijnsdorp & Vingerhoed, 2001). They are most active at night searching for benthic prey, which are detected by olfactory and tactile stimuli (Holmes & Gibson 1983; Gibson 2005).

Stock Structure

The North Sea sole is defined to be a single stock in ICES Subarea IV. The stock assessment is done accordingly, assuming sole in the North Sea is a closed stock between regions of Subarea IV(a, b, c). This approach was supported by a thorough population genetic analysis using neutral microsatellite markers and a mitochondrial marker by Cuveliers et al. (2012). This study showed genetic differences at a large scale, along a latitudinal gradient from the Skagerrak/Kattegat to the Bay of Biscay. At a smaller spatial scale within the North Sea however, the subpopulations seemed genetically homogeneous, probably due to a high level of gene flow and/or the high effective population size preventing strong effects of genetic drift. With respect to the temporal aspect, a remarkable high genetic stability was found from the 1950s up to present (Cuveliers et al., 2011).

Stock status, North Sea including Skagerrak

i) Spawning Stock Biomass

SSB has been increasing since 2007 and is estimated to be above B_{pa} in 2014. The trend in the spawning stock biomass is shown in Figure 13. The stock increased sharply following good recruitment in 1958 and this led to the rapid expansion of the trawl fishery for sole. It declined to close to the precautionary biomass level (B_{pa}) during the 1970's and 1980's before increasing sharply again following strong recruitment in 1987 and 1991. Since then it has declined reaching a minimum below B_{lim} in 2007 before recovering to fluctuate around B_{pa} in recent years. The perception of SSB is consistent with last year's assessment.

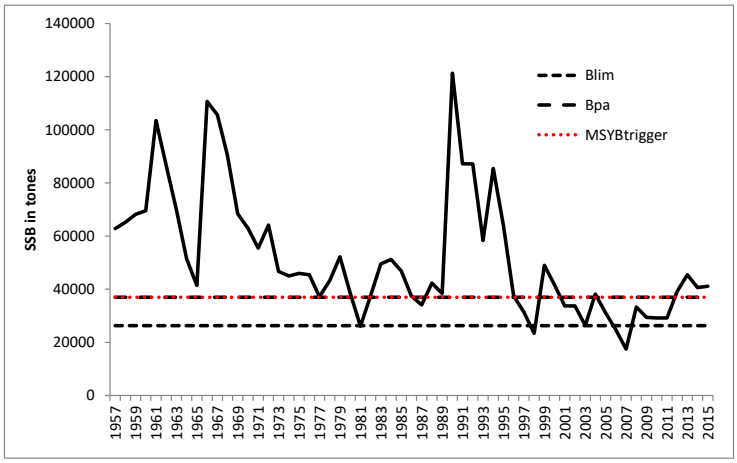


Figure 13 SSB of North Sea sole for the period 1957 to 2015 with Bpa and Blim shown (source: ICES, 2015b)

ii) Fishing mortality

Total fishing mortality (Figure 14) has shown a steady increase over the forty year period up to 1996 in line with increases in capacity and effort of the beam trawl fleet in the North Sea. Since then F has fallen slowly. Fishing mortality was estimated at 0.25 in 2014 which is close to F_{msy} (0.2).

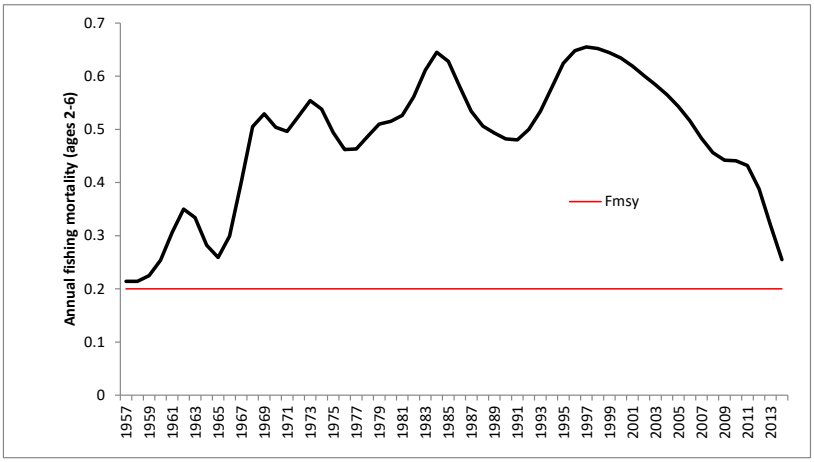


Figure 14 North sea sole total fishing mortality of landings plus discards (source: ICES, 2015b)

iii) Recruitment

Estimates of abundance of fish recruiting to the stock at age one are shown in Figure 15. Geometric mean recruitment is around 109 million one-year olds but there have been years with very strong recruitment often associated with cold winters such as 1958, 1963, 1987 and 1996. In recent years, recruitment has been close to the long term average and there has been a noticeable absence of the very strong recruitment seen in earlier periods. that it has been driven mainly by the reduction in fishing mortality rather than by strong recruitment. The recruitment estimated for 2015 was 103,741 thousands of fish.

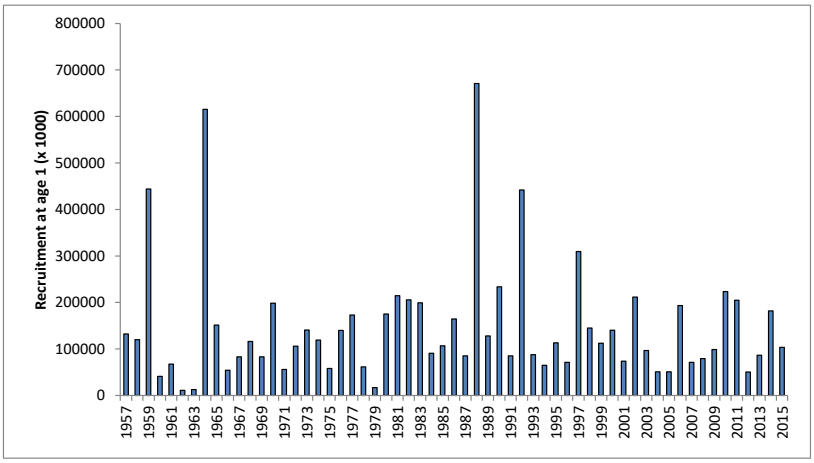


Figure 15 Recruitment of North Sea sole at age 1 in billions (source: ICES, 2015b)

iv) Stock-Recruitment relationship

There is no strong relationship between spawning stock size and recruitment and there is no indication of a minimum spawning stock size below which subsequent recruitment is likely to be impaired (Figure 16).

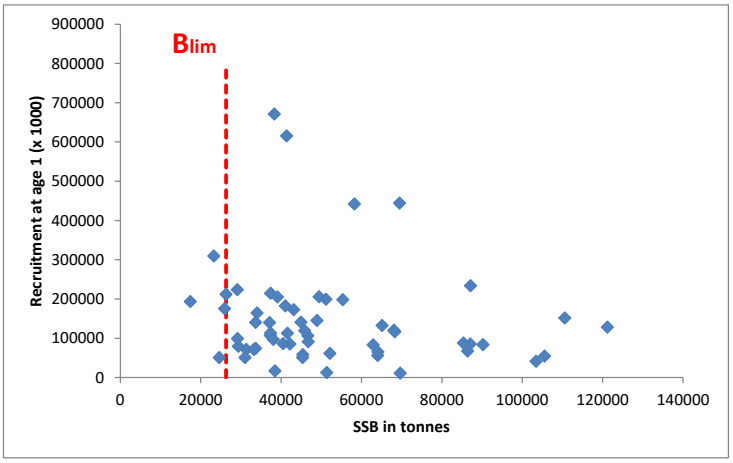


Figure 16 Relationship between the size of the spawning stock and number of recruits at age 1 (source: ICES, 2015b)

v) Catch and Landings

Landings data are available since 1957. The highest catches are observed in the nineties. Discards data are only available since 2002 (before are reconstructed) (Figure 17).

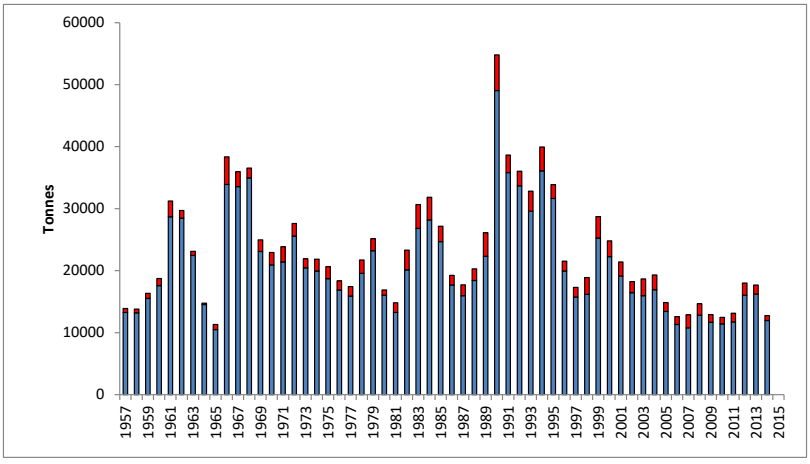


Figure 17 Landings (blue) and discards (red) of North Sea sole in thousands of tonnes (source: ICES, 2015c)

Biological Reference points

In 2014 the joint ICES-MYFISH Workshop (ICES, 2014) held place to consider the basis for F_{msy} ranges. The workshop convened again under the auspices of WKLIFE in march 2015 (ICES, 2015d). This eventually resulted in an F_{msy} range for sole of 0.13 - 0.27. The point value of F_{msy} was set at 0.2. B_{lim} was defined by the breakpoint in a segmented regression of the stock–recruitment relationship, resulting in 26,300 t, and B_{PA} was set at 37,000 t using the default multiplier of 1.4. F_{MSY} ranges can be determined with EqSim, where the upper boundary is never allowed to exceed the value of F that corresponds to 5% long-term probability of SSB<B_{lim}.

Type		Value	Technical basis
Precautionary approach	Blim	26,300 t	Breakpoint in segmented regression stock–recruitment relationship
BPA		37,000 t	1.4 *Blim
FMSY	FMSY	0.2	Median of stochastic MSY analysis assuming a Hockey stick stock recruit relationship.
Targets	Fmgt	0.2	EU management plan

Management Target Reference Points

The EU Multiannual Management Plan (MAMP; Council Regulation (EC) No. 676/2007) for the management of both plaice and sole states that the stocks of sole shall be deemed to be within safe biological limits in those years in which, according to the opinion of the Scientific, Technical, and Economic Committee for Fisheries (STECF), all of the following conditions are fulfilled:

- the spawning biomass of the stock of sole exceeds 35,000 tonnes;
- the average fishing mortality rate on ages two to six years experienced by the stock of sole is less than 0.4 per year.

Harvest Strategy and Harvest Control Rules

i) Harvest Strategy

The harvest strategy for sole is based on an EU Multiannual Management Plan (MAMP) for the management of both plaice and sole stocks (Council Regulation (EC) No. 676/2007). The plan entails a two stage process for managing the stocks. Firstly, by returning the stocks to within safe biological limits (Article 3) and in the second stage to exploit the stocks at MSY (Article 4).

Fishing effort has been restricted for demersal fleets in a number of EC regulations (EC Council Regulation No. 2056/2001, No. 51/2006, No. 41/2007 and No. 40/2008, annex IIa). For example, for 2007, Council Regulation (EC) No 41/2007 allocated different days at sea depending on gear, mesh size, and catch composition: Beam Trawls could fish between 123 and 143 days per year. Trawls or Danish seines could fish between 103 and 280 days per year. Gillnets could be allowed to fish between 140 and 162 days per year. Trammel nets could fish between 140 and 205 days per year.

Several technical measures are applicable to the mixed fishery for flatfish species in the North Sea: mesh size regulations, minimum landing size, gear restrictions and a closed area (the plaice box).

Mesh size regulations for towed trawl gears require that vessels fishing North of 55°N (or 56°N east of 5°E, since January 2000) should have a minimum mesh size of 100 mm, while to the south of this limit, where the majority of the sole fishery takes place, an 80 mm mesh is allowed. In the fishery with fixed gears a minimum mesh size of 100 mm is required.

The minimum landing size of North Sea sole is 24 cm. The maximum aggregated beam length of beam trawlers is 24 m. In the 12 nautical mile zone and in the plaice box the maximum aggregated beam length is 9 m. A closed area has been in operation since 1989 (the plaice box). Since 1995 this area was closed in all quarters. The closed area applies to vessels using towed gears, but vessels smaller than 300 HP are exempted from the regulation.

ii) Harvest Control Rules

The harvest control rules are defined by the MAMP and set out how the TAC should be determined in relation to precautionary reference points and the long term management reference point.

In the first stage, the procedure for rebuilding the stocks to within safe biological limits are set out in Article 3 by reducing fishing mortality on plaice by 10% each year with the constraint that the TAC should not be allowed to vary by more than 15% per year. In the second stage, the objectives of the multiannual plan are to ensure exploitation of the stocks of plaice and sole on the basis of maximum sustainable yield. The procedure for setting the TAC in this stage is defined in Article 8:

> *1. The Council shall adopt a TAC for sole at that level of catches which, according to a scientific evaluation carried out by STECF is the higher of: (a) that TAC the application of which will result in the level of fishing mortality rate of 0.2 on ages two to six years in its year of application; (b) that TAC the application of which will result in a 10 % reduction in the fishing mortality rate in its year of application compared to the fishing mortality rate estimated for the preceding year.*
>
> *2. Where the application of paragraph 1 would result in a TAC which exceeds the TAC of the preceding year by more than 15 %, the Council shall adopt a TAC which is 15 % greater than the TAC of that year.*
>
> *3. Where the application of paragraph 1 would result in a TAC which is more than 15% less than the TAC of the preceding year, the Council shall adopt a TAC which is 15% less than the TAC of that year.*

The HCRs have been effective along with the reduction in overall effort in the fleets in achieving exploitation of sole at or below the long term management target.

iii) Management Advice for 2015

The agreed TAC for 2015 was 11,893t based on the EU management plan (Council Regulation No. 676/2007). This was expected to lead to an SSB of around 50,022t in 2016.

ICES advises that when the second stage of the EU management plan (Council Regulation No. 676/2007) is applied, catches in 2016 should be no more than 12,835t. If this stock is not under the EU landing obligation in 2016 and discard rates do not change from the average (2012–2014), this implies landings of no more than 11,921t.

Data Collection

Landings data by country and TACs are available since 1957. The Netherlands has the largest proportion of the landings, followed by Belgium. Discards data are only available since 2002, with the Netherlands, Belgium, Germany, and Denmark each starting their observation programs in a different year. The discards percentages observed in the Dutch discard sampling programme were much lower for sole (for 2002–2008, between 10–17% by weight) than for plaice. No significant trends in discard percentages have been observed since the start of the programme.

Age and sex compositions and mean weight at age in the landings have been available for different countries for different years. In the more recent years, age compositions and mean weight-at-age in the landings have been available on a quarterly basis from Denmark, France, Germany (sexes combined) and The Netherlands (by sex). Age compositions on an annual basis were available from Belgium (by sex). Overall, the samples are representative of around 85% of the total landings. For the final assessment, the age compositions are combined separately by sex on a quarterly basis and then raised to the annual international total. Alternatively, sex separated landings-at-age and weights-at age can be calculated from the data. Since the mid-1990s, annual sole catches have been dominated by single strong year classes (e.g. the 2005-year class).

Weights-at-age in the landings are measured weights from the various national market sampling programs. Weights-at-age in the stock are the 2nd quarter landings weights, as estimated by the Fishbase database computer program used for raising North Sea sole data. Over the entire time-series, weights were higher during the 1970s and 1980s compared to time periods before and after. Estimates of weights for older ages fluctuate more because of smaller samples sizes due to decreasing numbers of older fish in the stock and landings.

Natural mortality has been assumed constant over all ages at 0.1 since the start of the assessment period (1957), except for 1963 where a value of 0.9 was used to take into account the effect of the severe winter (1962–1963; ICES, 1979).

The maturity ogive is based on market samples of females from observations in the sixties and seventies. Mollet *et al*. (2007) described the shift of the age at maturity towards younger ages. A knife-edged maturity-ogive is used, assuming no maturation at ages 1 and 2, and full maturation at age 3.

There are five trawl surveys that could potentially be used as tuning indices for the assessment of North Sea sole.

- The BTS-ISIS (Beam Trawl Survey)
- The SNS (Sole Net Survey)
- The UK Corystes survey
- Belgium BTS survey
- German BTS survey

The BTS-ISIS (Beam Trawl Survey) is carried out in the southern and south-eastern North Sea in August and September using an 8 m beam trawl. The SNS (Sole Net Survey) is a coastal survey with a 6 m beam trawl carried out in the 3rd quarter. Data from 2003 and 2012 were omitted from the assessment because of changes in the survey in that year, or because not enough stations were sampled. In 2003 the SNS survey was carried out during the 2nd quarter and data from this year were omitted from the assessment. The research vessel survey time-series have been revised by WGBEAM (ICES, 2009). WKFLAT 2010 decided to not use the UK Corystes survey because of lack of information on the raising procedure and spatial coverage of the UK Corystes series. WKNSEA 2015 decided not to use the German and Belgium BTS surveys. The German BTS survey was not used because it failed to detect cohort signals since 2010 and because the index was unavailable since 2012. The Belgian BTS survey was not included because it was only available since 2007 and because including it was found to increase the retrospective pattern in the assessment; however, WKNSEA 2015 (ICES, 2015c) recommended attempting its incorporation again in the future. In the assessment, the BTS-ISIS and SNS indices, calculated by WGBEAM, are used for tuning the stock assessment.
There is one commercial fleet available that can be used as a tuning series for the stock assessment, being the Dutch beam-trawl fleet. This fleet takes more than 70% of the landings, and is relatively homogeneous in terms of size and engine power. The data from this commercial fleet can be estimated using two different methods. The first method uses the total landings, and creates the age distribution for these landings by segregating the total landings into market categories, with age distributions being known within market categories through market sampling. Effort for the Dutch commercial beam-trawl fleet is expressed as total HP effort days. Effort nearly doubled between 1978 and 1994 and has declined since 1996. Effort during 2008 was <40% of the maximum (1994) in the series. A decline of circa 25% was recorded in 2008 following the decommissioning that took place during 2008.
Alternatively, the data for the Dutch beam trawl fleet can be raised as described by (WGNSSK 2008, WD1). This allows reviewing the lpue trends in different areas of the North Sea. The data are based on various sources (WGNSSK 2008, WD1). There is a clear separation in lpue between areas, with the southern area producing a substantially higher lpue than the northern area. Average lpue of a standardized NL beam trawler (1471 kW) over the period 1999 to 2007 was 266 kg day-1, and the data have a significant ($P<0.01$) temporal trend of -6.1 kg day-1 year-1.
The beam-trawl fleet has changed gear use over the last ten years, switching from the traditional beam-trawl gear to wing-shaped gear and subsequently also to pulse fishing. In 2014, there was only very limited effort left with the traditional gear. As a result of the changes in the gear, the catchability has likely changed. Hence, WKNSEA 2015 decided not to use the lpue series in the assessment. However, WKNSEA 2015 recommended investigating the possible incorporation of the Dutch commercial pulse cpue data when a longer time-series becomes available.

Stock assessment method

WKNSEA 2015 decided that an AAP (Aarts and Poos, 2009) model was appropriate for the assessment of this stock. The previously used XSA assumes the catch-at-age matrix is complete and without error. The AAP method is a variety of statistical catch-at-age model that uses splines to estimate the selectivity patterns in the surveys and for the catch-at-age matrix. Spline smoothers are used to describe the F-at-age matrix, the catchabilities at-age of the tuning indices, and the discards fraction-at- age. The main reason for changing from XSA to AAP was to be able to incorporate the incomplete time-series of discards consistently into the assessment.

There are three differences compared to the model by Aarts and Poos. 1) modelling of the F-at-age matrix by means of a tensor spline rather than using a full separability assumption. In the AAP model,

the F-at-age matrix describing the F estimates for each year and age is built using a selectivity pattern over the ages (ranging between 0 and 1), an annually varying product of catchability and effort. Here, we describe the F-at-age matrix by using a design matrix for a tensor product smoother taken from the GAM function in R (Wood, 2006). The degree of smoothness depends on the dimensions of the bases for age and year. The design matrix is multiplied by the total number of parameters required to describe the tensor product smoother, being equal to the product of the bases for age and year. To ensure that the F-at-age matrix remains positive throughout the optimization, the tensor product smoother is exponentiated. 2) The proportion discarded at-age is described by a simple logistic function. 3) implementation of the maximum likelihood search in ADMB (Fournier et al., 2012) rather than in R.

The AAP model is compatible with FLR, allows adding any number of tuning indices, deals with missing values in any of the data sources, and takes a control object with the structural model assumptions. These include: 1) The number of parameters used for the tensor spline (for ages and years separately), the age at which the “q-plateau” starts for the tuning indices, and the number of parameters used for description of the selectivity-at-age of the tuning indices.

The SAM model is a state–space assessment model. An advantage of using AAP and SAM over XSA would be that they take into account (and show) the uncertainty of the assessment inputs and outputs. The SAM model has been run in some years in parallel to the main assessment model for the sole stock, but it was not presented or discussed at WKNSEA 2015.

Key Low Trophic Level Species

The assessment team has considered the status of the target species with respect to the criteria for determining “Key Low Trophic Level” species set out in the MSC FCR Annex SA 2.2.9. We conclude that the target species plaice is a predator of small fish and benthos and is not a key lower trophic level species.

3.4 Principle Two: Ecosystem Background

Principle 2 of the Marine Stewardship Council standard states that:

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

The following section of the report highlights some of the key characteristics of the fishery under assessment with regard to its wider impact on the ecosystem.

It begins with a description of the North Sea environment before going on to describe retained and by-catch species, ETP species, habitat and ecosystem. Finally, a summary of recent and ongoing research in relation to the impacts of the pulse trawl is provided (section 3.4.6).

3.4.1 The North Sea environment

Oceanography

The North Sea is semi-enclosed, opening northwards to the Norwegian Sea and North east Atlantic and with the coasts of the UK to the west and western Europe and Norway to the east. In the south, the relatively narrow Dover Straits and the English Channel joins the North Sea to the Atlantic, and to the east the North Sea is linked to the Baltic Sea via the Skaggerak and Kattegat. The southern North Sea is generally shallow (< 40m), whilst northwards from the Dogger Bank water depths generally vary between 40 and 100m, but increase to more than 250m in the Norwegian Trench off south-west Norway. The general features (bathymetry, seabed type, location of wrecks and underwater obstructions) of the North Sea are well described in marine navigation charts available from the Hydrographic Offices of the UK and other countries bordering the North Sea.

The main inflow from the North-east Atlantic into the North Sea occurs along the western slope of the Norwegian Trench, though there is significant inflow through the Faroe-Shetland channel. Every year, 5000km^3 of water from the Atlantic Ocean flow via the Strait of Dover between England and France into the North Sea[2] (Figure 18).

Source: www.zeeinzicht.nl

Figure 18 Ocean currents in the North Sea

Situated just north of the Dogger Bank, the Flamborough Front marks a transition from seasonally thermally-stratified water to the north to waters that are generally vertically mixed throughout the year in the southern North Sea, though horizontal salinity fronts occur off river estuaries (Munk et al., 2009;

[2] www.zeeinzicht.nl

OSPAR, 2000). The strong tidal and wind-driven flows in the southern North Sea are highly relevant for plaice and sole, as they carry eggs and larvae from the main spawning grounds in the Southern Bight (plaice) and the German and Danish Bights (sole) towards suitable nursery grounds along the coasts of Germany and the Netherlands (Taylor et al., 2007). Inter-annual variability in these flows has been suggested to be an important factor affecting the numbers of settling plaice arriving at the nursery grounds (Bolle et al., 2009; van der Veer, 1998). Figure 19 presents an overview of seabed bathymetry for the North Sea.

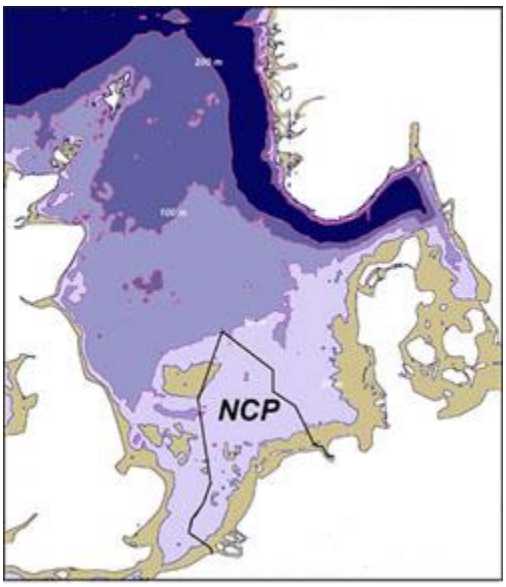


Figure 19 North Sea bathymetry

Source: RIVO, Netherlands

Figure 20 presents a 3D graphic of the North Sea – allowing better visualisation of the bathymetry, the shallow-ness of the Dogger Bank and the kind of depths of water CVO vessels would be fishing in.

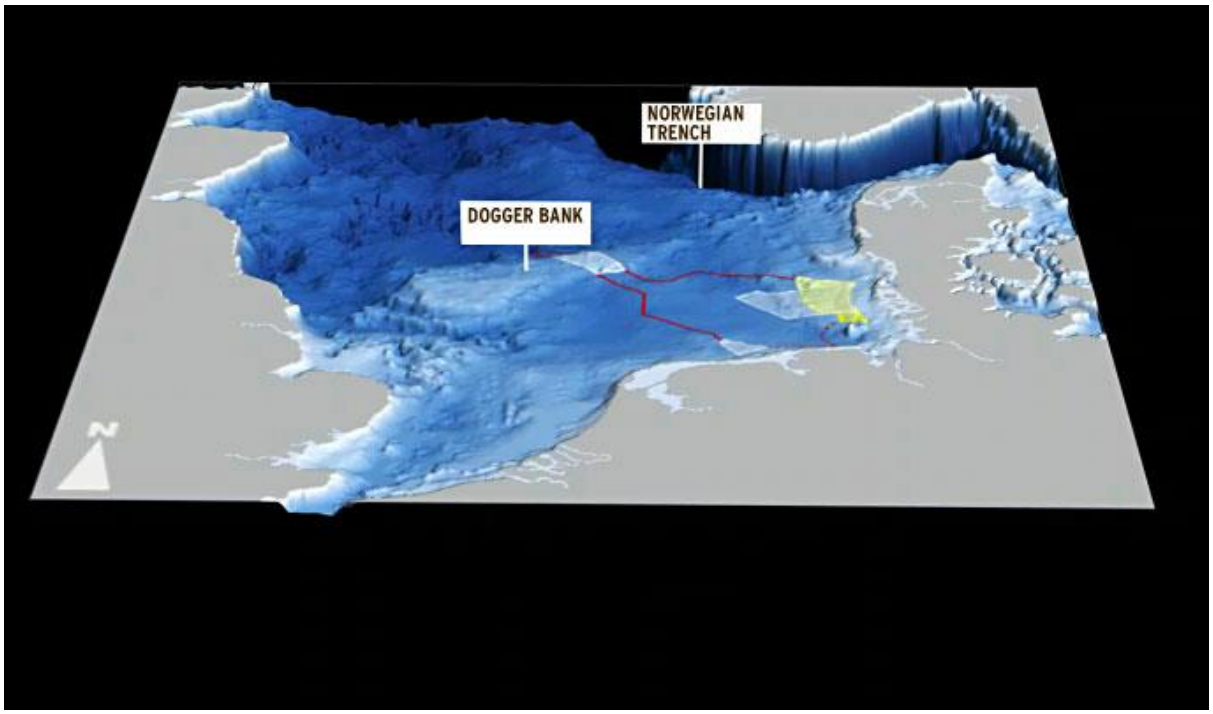


Figure 20 Bathymetry of North Sea showing Dogger Bank

Source: http://dev1.bfn.eu/habitatmare/en/schutzgebiet-nordsee-blick-von-sueden.php

Seabed types

The substrata are dominated by sands in the southern and coastal regions and by fine muds in deeper and more central parts (Figure 21). Sands become generally coarser to the east and west, interspersed with patches of gravel and stones as well. Local concentrations of boulders are found in the north-eastern part of the North Sea. In the shallow southern part this hard-bottom habitat has become scarcer, because boulders caught in beam trawls are often brought ashore. The deep areas of the Norwegian Trench are covered with extensive layers of fine muds, while some of the slopes have rocky bottoms. Several underwater canyons extend further towards the coasts of Norway and Sweden.

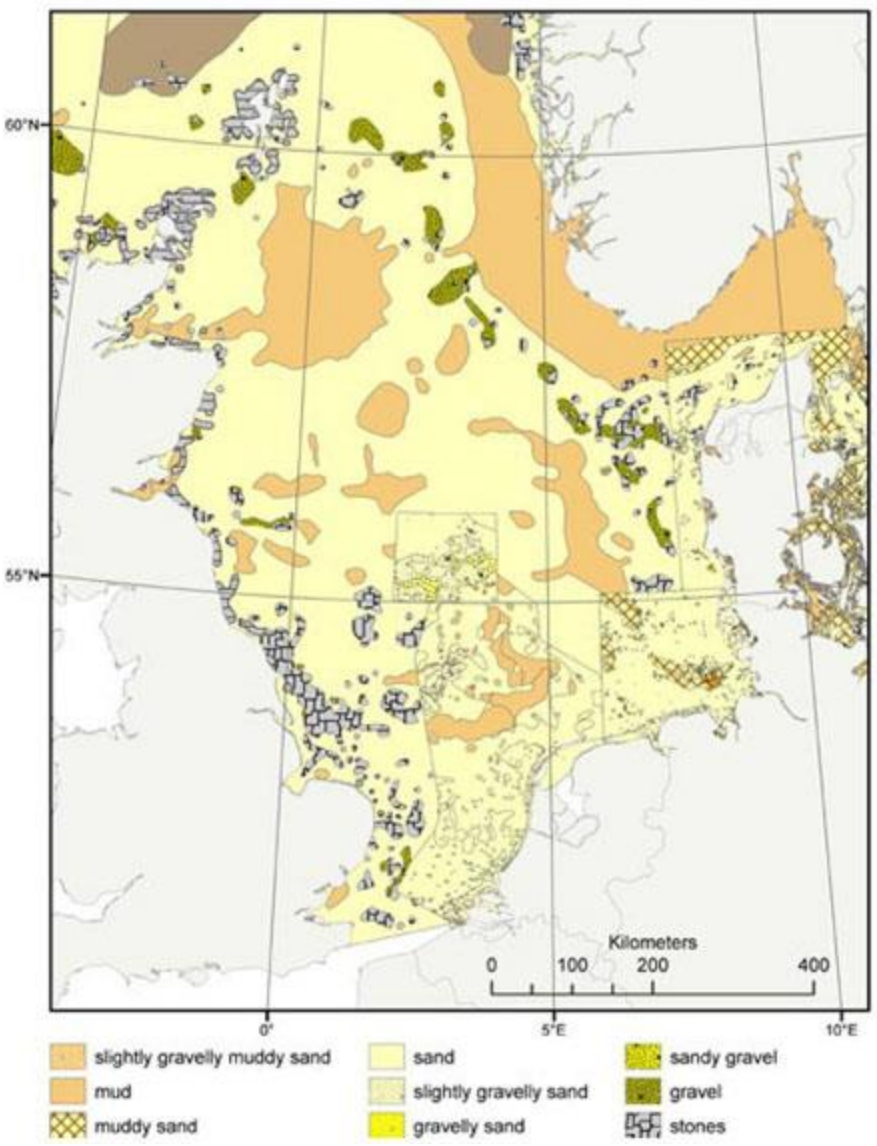


Figure 21 Aggregated sediment map of the North Sea

Source: Digital Atlas of the North Sea, http://epic.awi.de/22497/1/Sch2009bi.pdf

The North Sea has long history of fishing and shipping, thus the general seabed characteristics have been recorded on navigation charts for at least 200 years. Consequently, North Sea sediment types and morphology are well characterized at the broad scale (Pantin, 1991, Eisma, 1981). Sediments in Divisions IVb and IVc are mainly sand or muddy sand with patchy coarse sand and gravel deposits adjacent to the coasts. Areas of clay, clay gravel and softer mud are also found in some areas e.g.

just east of the Dogger Bank. In addition, there is significant re-suspension and transport of sediments in the southern North Sea as a result of the strong tidal flows in the area and storm events, which affects ecologically relevant parameters such as water transparency (Lee and Folkard, 1969).

3.4.2 Retained and Bycatch species

3.4.2 Retained and Bycatch species

Retained species are those that are caught and landed together with sole and plaice, the target species under assessment. Sole and plaice are considered under P1, and are not further considered here. The proportions of retained and bycatch species are calculated as the proportion of the total catch rather than landings. The species and their proportions are listed in table 3.4.2.1.

Landing & discarding data were provided by IMARES for 2013 and 2014 (see tables showing 2014 data in appendix 6). These are the primary sources of information used to determine retained and bycatch species and proportions[3]. Together these were used to calculate percentage of catch per species. Species are then categorised as retained or bycatch species (i.e. bycatch species are those that were reported in discard sampling trips, but do not feature in the landings data) for the purposes of scoring the fishery.

For the pulse trawl (80mm mesh size) the one main retained species (above 5% of total catch) is **dab**. The remainder (other than Starry ray, now considered an ETP species) are minor retained species or minor bycatch species.

Table 3.4.2.1 Species allocation between retained and bycatch for the purposes of scoring (main species in bold)*.

	Retained Species (considered under 2.1)		**% of total**	**Bycatch Species (considered under 2.2)**		**% of total**
	Scientific name	**English name**	**Catch**	**Scientific name**	**English name**	**Catch**
1	***Pleuronectes platessa***	**Plaice**	**39.5**	*Salvelinus malma*	Dolly varden**	2.8
2	***Solea solea***	**Sole**	**19**	*Callionymus lyra*	Dragonet	1.6
3	***Limanda limanda***	**Dab**	**17.8**	*Ammodytes spp*	Sandeels	0.4
4	*Merlangius merlangus*	Whiting	2.8	*Clupea harengus*	Atlantic herring	0.4
5	*Psetta maxima*	Turbot	1.6	*Mustelus spp*	Smooth-hounds nei	0.4
6	*Scophthalmus rhombus*	Brill	1.6	*Glyptocephalus cynoglossus*	Witch flounder	0.4
7	*Microstomus kitt*	Lemon sole	1.2	*Scomber scombrus*	Atlantic mackerel	0.4
8	*Raja montagui*	Spotted ray	1.2	*Solea lascaris*	Sand sole	0.4
9	*Gadus morhua*	Cod	0.8	*Sprattus sprattus*	European sprat	0.4
10	*Trigla lucerna*	Tub gurnard	0.8	*Zeus faber*	John dory	0.4
11	*Scyliorhinus canicula*	Lesser spotted dogfish	0.8	*Aequipecten opercularis*	Queen scallop	<0.1
12	*Eutrigla gurnardus*	Grey gurnard	0.8	*Mytilus edulis*	Blue mussel	<0.1

[3] Many other reports on pulse trawl catch were reviewed by the assessment team and are referenced elsewhere. These were found to be more limited in scale (ie. small number of trips) and often focus on the catch target species only (plaice and sole) and therefore the IMARES data are used here.

	Retained Species (considered under 2.1)		% of total	Bycatch Species (considered under 2.2)		% of total
	Scientific name	English name	Catch	Scientific name	English name	Catch
13	*Raja clavata*	Thornback ray	0.8	*Pagellus erythrinus*	Common pandora	<0.1
14	*Trisopterus luscus*	Bib	0.8	*Solen spp*	Solen razor clams nei	<0.1
15	*Platichthys flesus*	Flounder	0.4	*Spisula solidissima*	Atlantic surf clam	<0.1
16	*Lophius piscatorius*	Anglerfish	0.4			
17	*Aspitrigla cuculus*	Red gurnard	0.4			
18	*Melanogrammus aeglefinus*	Haddock	0.4			
19	*Trachurus trachurus*	Horse mackerel	0.4			
20	*Mullus surmuletus*	red mullet	0.4			
21	*Raja brachyura*	Blonde ray	0.4			
22	*Sepia officinalis*	cuttlefish	0.2			
23	*Trachinus draco*	Greater weever	<0.1			
24	*Trachinus vipera*	Lesser weever	<0.1			
25	*Buccinum undatum*	Whelk	<0.1			
26	*Cancer pagurus*	Edible crab	<0.1			
27	*Carcharias taurus*	Grey nurse shark	<0.1			
28	*Crangon crangon*	Common shrimp	<0.1			
29	*Dicentrarchus labrax*	Sea bass	<0.1			
30	*Galeocerdo cuvier*	Tiger shark	<0.1			
31	*Homarus gammarus*	European lobster	<0.1			
32	*Lepidorhombus whiffiagonis*	Megrim	<0.1			
33	*Leucoraja naevus*	Cuckoo ray	<0.1			
34	*Loliginidae*	Squids	<0.1			
35	*Lolliguncula spp*	Thumbstall squids	<0.1			
36	*Martialia hyadesi*	Sevenstar flying squid	<0.1			
37	*Merluccius merluccius*	Hake	<0.1			
38	*Nephrops norvegicus*	Norway lobster	<0.1			
39	*Pollachius virens*	Saithe	<0.1			
40	*Anarhichas lupus*	Wolffish	<0.1			

* Starry ray (*Raja radiata*) reported in landings (Annex 6, Table 3.4.2.1) is considered an ETP species.

**The known distribution of Dolly varden (*Salvelinus malma*) and Tiger shark *(Galeocerdo cuvier)* suggest these may be misidentified. Their reported presence does not alter scoring results.

As the discard data are from 13 self-sampling vessels, over part of a year, there is uncertainty when raising these data to fleet level for the UoC. While more information may result in re-allocation of species among categories and greater accuracy in calculating total catch composition, this is sufficient for scoring purposes and would not be expected to change scores.

Dab *Limanda limanda*:

The 2014 landings data provided by the client shows that Dab was a main retained species, at 5.2%, although the majority of dab caught are discarded as dab amounted to 18% of the total catch.

ICES Advice (June 2015a) for dab is the same as for 2014, namely this is a data limited stock, and that catches should be no more than 7608 t if discard rates do not change from the high average of the last 3 years (2012-2014). There are no reference points for this fishery. Survey indices show a highly variable abundance without a trend.

None of the other species listed in Table 3.2.4.1 are main retained species as defined by the MSC CR1.3.

Information

Landings data are well recorded at fish auctions and by the management authority via logbooks with crosschecks undertaken by control authorities to validate data.

Pulse trawl vessels are covered in the Data Collection Framework (DCF) program[4] conducted by IMARES. Until recently, data collection and reporting in the DCF program did not distinguish between pulse trawl and beam trawl. Considering the number of pulse trawl vessels involved in demersal fishery, there are currently discussions to separate the two gears in the reporting. In future years, the CVO is planning to compile landings data of the pulse trawl vessels on a yearly basis and make these publically available.

For the purpose of this assessment, IMARES has provided itemised catch data for pulse trawl for the 2014 season. For 2015, 12 pulse trawl vessels are included in the DCF program. The participating vessels sample their catches themselves and bring the samples to shore where they are analysed by IMARES. On average, a vessel takes a sample each month of the year. In addition, the data from the self-sampling program is verified through independently collected data on DCF observer trips. The DCF will be extended during the course of 2015 with more pulse trawl vessels and more observer trips on board of pulse trawl vessels. This extension will be commissioned by the Ministry of Economic Affairs.

The differences between self-sampling and observer data have been explored. An extensive monitoring programme was conducted in 2012 (Rasenberg *et al* 2014), consisting of both self-sampling and observer monitoring, on the catch composition of the Dutch pulse fishery targeting flatfish. The self-sampling program showed an average catch composition in 2012 of 31% landings, 17% fish discards, 18% benthos, and 34% debris. The average catch composition of the observer program consisted of 29% landings, 29% fish discards and 42% benthic species and debris. Regarding discard levels, information was collected on the target species, sole and plaice, only, whereby the plaice and sole catches of the pulse self-sampling and observer program (2012, >300hp) are compared with the plaice and sole catches of the beam trawl fishery (2012, >300hp) from the DCF program. The average discard percentage of plaice from the pulse trawl observer program (52%) is similar to the plaice discard percentage of the beam trawl trips (49%). The average discard percentage of the pulse self-sampling program is lower (42%). The actual amount of plaice discards recorded in the pulse self-sampling (27 kg/hour) and observer program (66 kg/hour) are lower than in the beam trawl fishery (87 kg/hour).

Van Marlen et al, (2011, 2014) conducted a catch comparison between three vessels (two pulse trawlers and one beam trawler) fishing side-by-side for one week in 2011. Landings and discards were compared between the three vessels. The purpose of this study was to assess the differences in catch efficiency and selectivity of pulse trawlers compared to a beam trawler. Landings and discards of the pulse trawlers were mostly expressed as percentages of the landings and discards of the beam trawler. The results were based on one fishing trip (33 hauls) and vessels did not fish in the area

[4] EU DCF (Data Collection Framework) reporting requirements: https://datacollection.jrc.ec.europa.eu/

where they would normally choose to go. It showed that the amount of discarding in terms of kg/hr of plaice was considerably lower for pulse trawling compared with beam trawling.

In 2012 Rasenberg et al (2014) conducted a study on 25 pulse trawlers during their commercial practices, taking weekly catch samples throughout the year (2012), covering all major fishing areas. The main purpose of this study was to gain insight into the catch composition of the pulse trawl fleet during their normal commercial practices. Data was gathered by a combination of self-sampling and observer trips. The study only covered pulse trawlers. However, it was considered to be valuable (as a secondary goal) to compare the pulse trawl results with landings and discards of conventional trawls.

Both studies have limited interpretation and are not directly comparable. However, both showed that pulse trawl vessels discard less kg plaice compared to beam trawl vessels for the same number of fishing hours. Actual landings and discards of plaice are lower with pulse trawling, while the data showed a slight increase in sole landings. A study by LEI (Taal, K. and A. Klok 2014; Taal K., Hoefnagel E, 2010) also showed that the pulse gear was more efficient for sole than the beam trawl, supporting the catch efficiency comparison of van Marlen et al.,2014. This, combined with the lower speed of the pulse trawl, indicates that the same amount of sole is caught in fewer days at sea and a smaller total swept area.

From 2016 the EU landing obligation is to be introduced for demersal fleets, whereby discards of target species (sole in this case) will not be permitted. From 2019 all quota species will be subject to the landing obligation. This is a strong incentive to reduce discards through changing fishing patterns and increased gear selectivity across most European fleets, including the pulse fleet.

Survivability

A summary of recent studies on survivability of discards has been published by STECF (2014)[5] and pulse trawl was one of the gears involved. In general, the studies identified show that elasmobranchs, specifically species of ray, have the highest and most consistent levels of discard survival. Survival rates are typically in excess of 50% across all gears and greater than 80% in many cases. Studies which have looked at flatfish species including plaice (*Pleuronectes platessa*) and sole (*Solea solea*) and dab (*Limanda limanda*) show variable results between species, with plaice exhibiting higher (~40 – 80%) levels than sole and dab. Survival of plaice has also been shown to be length dependent, with smaller individuals showing lower survival rates than older fish. Survival was also shown to decrease during spawning periods. However, the survival estimates from captive observation studies are therefore likely to represent over-estimates of actual survival (STECF 2014).

Skates and Rays

Many elasmobranchs are slow growing, have a late age-at-maturity, low reproductive capacity, they are large in size and have an aggregating behaviour. Because of this they are considered to be highly vulnerable to over-exploitation. Skates (Rajidae) are oviparous, and often produce more young than live-bearing species. Some species of demersal elasmobranchs may be locally common and found in discrete areas. Resource competition and species interactions between the various skate species is poorly understood. Historically, common skate have been known to predate on individuals of smaller skate species, and the longer-term decline in the larger skates may have benefited populations of smaller skate species.

Demersal elasmobranchs are caught as a bycatch in the mixed demersal fisheries for roundfish and flatfish. A few inshore vessels target skates and rays with tangle-nets and longlines. Landings have declined since their peak in 1982. TACs only regulate the landings, and a low TAC on a low-value bycatch species could induce more discards. Because the elasmobranch species are usually caught as a bycatch in demersal fisheries, they would benefit from a reduction in the overall demersal fishing effort.

The European Commission publishes an annual regulation setting out fishing opportunities, or Total Allowable Catches, for EU Member States (Regulation 2015/104). For some years, certain TACs for stocks of elasmobranchs (skates, sharks, rays) have been set at 0, with a linked provision

[5] Scientific, Technical and Economic Committee for Fisheries (STECF) – Landing Obligations in EU Fisheries - part 4 (STECF-14-19). 2014. Publications Office of the European Union, Luxembourg, EUR 26943 EN, JRC 93045, 96 pp.

establishing an obligation to immediately release accidental catches. The reason for this specific treatment is that those stocks are in a poor conservation status and, because of their high survival rates, discards will not raise fishing mortality rates for them. Precautionary TACs have been set for several species of ray of relevance to this fishery (Cuckoo ray, Thornback ray, Blonde ray, Spotted ray) and a 0 TAC for spurdog. Article 12 of regulation 2015/104 includes a list of species where catches are prohibited in ICES areas IV a,b These are therefore considered under ETP species in section 3.4.3

When accidentally caught, species should not be harmed and should be promptly released. Considering that a study by Desender et al (2015) showed the effect of pulse on Thornback rays and lesser-spotted dogfish to be minimal, the fishery should be able to release live skates and rays back to the sea.

Under quota allocations in 2015/104, several species are listed separately as allowing no TAC in ICES area IV:

Spurdog (*Squalus acanthias*) and tope shark (*Galeorhinus galeus*): these species shall not be targeted. When accidentally caught in fisheries not yet subject to the landings obligation, specimens shall not be harmed and shall be released immediately.

Cuckoo ray (*Leucoraja naevus*), Thornback ray (*Raja clavata*), blonde ray (*Raja brachyuran*), and spotted ray (*Raja montagui*): catches of these species shall be reported separately (EU Regs. 2015/104). By-catch quota for these species: no more than 25% by live weight of the catch retained on board per fishing trip. This condition applies only to vessels over 15m length overall. This provision does not apply for catches subject to the landing obligations.

For some elasmobranch species, catches are either constrained by a TAC (rays) or are required to be returned to sea alive (spurdog). Spurdog has a zero-TAC. The TAC for ray applies to several species, as outlined in Council Regulation (EU) 2015/104. Fishermen are obliged to report landings >50kg (per species, per trip, per vessel) in their electronic logbooks. The EU TAC is subdivided into national quota. All ray landings are counted against the national quota. Dutch PO's limit landings per vessel in order to ensure that the Dutch fleet remains within the national quota (in 2015 a maximum of 100kg deadweight per vessel per week). In addition, Dutch PO's have agreed on a minimum landing size for rays of 55cm. In the case of violation of these rules, the PO's impose fines of €3,00 per kg.

As table 3.4.2.1 indicates, these species represented a very small proportion of the catch by the pulse trawl fishery in 2014. Based on landings data over 2014, the pulse trawl vessels landed 58t of spotted ray, 89t of thornback ray and no landings of spurdog and small amounts feature in the ETP logs – see table 3.4.3.2).

The UoC is also active in minimising impacts on elasmobranchs. CVO Management Strategy states that CVO will actively inform the pulse trawl fishermen on voluntary measures to increase survival of sharks and rays in the North Sea (in case of catches) and will stimulate them to implement these. CVO started this in June 2015, by distributing information on this topic through the newsletters and websites of both Visned and Dutch Fishermens Association and the CVO. Additional communication on this topic will coincide with the publication of the updated ID-guide for rays and sharks which is scheduled for the autumn of 2015.

3.4.3 Endangered, Threatened or Protected Species (ETP)

ETP species are defined as those that are recognized as such by national legislation and/or binding international agreement (e.g. CITES) to which the jurisdictions controlling the fishery under assessment are party. It is determined, following clarification from the MSC, that ETP-status should extend to the elasmobranch species listed for which catches are prohibited[6] (as opposed to zero TAC species).

Species that appear exclusively on non-binding lists such as ASCOBANS, IUCN Red List, OSPAR, HELCOM or that are only the subject of intergovernmental recognition (such as FAO International Plans of Action) and that are not included under national legislation or binding international agreement, are not considered as ETP under MSC protocols.

[6] Listed in Article 12 of Annual fishing opportunities Regulation 2015/104

Table 3.4.3.1 lists the ETP species that have been identified as being relevant to the assessment of the Dutch pulse trawl sole and plaice fishery.

Table. 3.4.3.1 ETP species relevant to CVO pulse fishery

	CITES	**Council Directive 92/43/EEC**	**EU Council Reg 2015/104**
Species	Appendix II	Habitats Directive Appendix II	Prohibited catches in ICES Area IV a & b
Harbour porpoise *Phocoena phocoena*			
Harbour Seal *Phoca vitulina*			
Grey Seal *Halichoerus grypus*			
Basking shark *Cetorhinus maximus*			
Eel *Anguilla anguilla*			
Allis Shad *Alosa alosa*			
Twait Shad (*Alosa fallax)*			
Sturgeon *Acipenser sturio*			
Kitefin shark *Dalatias licha*			
Undulate ray *Raja undulata*			
Tope *Galeorhinus galeus*			
Starry ray *Amblyraja radiata*			
Common skate *Dipturus batis* complex (*D. cf. flossada* and *D. cf. intermedia*			
Guitarfishes *Rhinobatidae*			
Birdbeak dogfish –			

Deania calcea			
Great lanternshark *Etmopterus princeps*			
Porbeagle – *Lamna nasus*			
Angel shark – *Squatina squatina*			
Portuguese dogfish – *Centrosymnus coelolepsis*			
Leafscale gulper shark *Centrophorus squamosus*			

Source: Assessment team

Information on ETPs

Populations of ETP species are well studied in the North Sea, with considerable work undertaken in relation to the regular monitoring of fisheries interaction through the deployment of onboard scientific observers, capture of anecdotal information, focused national study/research programmes and a range of EU funded research programmes.

Common skates *Dipturus batis*

The common skate *Dipturus batis* was formerly widely distributed over much of the North Sea but has declined throughout its range and is now only found rarely, mainly in the northern North Sea (WGEF 2014c). It is the largest of the European batoid fish, reaching lengths of 285 cm and weights of 100kg. It is a demersal species and frequently inhabits coastal areas and shelf seas. Fisheries independent surveys that have informed ICES Working Group reports found the distribution of common skate to occur across depths of 85-1000 m.

The magnitude of decline is differentially well documented in various areas, but it is known to have severely declined in most shelf areas (ICES, 2002). For example, *D. batis* has been commercially extinct in the Irish Sea for some years and has declined severely in the North Sea. The common skate was assessed by IUCN as 'Endangered' in 2000 and upgraded to 'Critically Endangered' in 2006, suggesting it 'is facing an extremely high risk of extinction in the wild' (IUCNredlist.org, 2015). If skate are taken within European waters, they must be returned to the water immediately (Council Regulation (EU) 2015/104).

ICES Advice given in October 2014 (2014d) is the same as 2012: Based on the precautionary approach, ICES advises that there should be no targeted fishery and measures should be taken to minimize bycatch. Additional measures should be identified that can regulate exploitation. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context."

Starry ray*, A.radiata:*

A.radiata stable. Survey catch rates increased from the early 1970s to the early 1990s and have decreased since then (ICES WGEF 2014c). Little information is available on discarding of this species, but it is known to be comparatively high (ICES 2014e). Based on ICES approach to data-limited stocks, ICES (2014e) advises that catches should be reduced by 36%. However, as species-specific landings data are not complete, it is not possible to quantify the current catch. ICES does not advise on an individual TAC for this species, which is discarded in most fisheries. Additional measures should be identified that can regulate exploitation. Such measures may include seasonal and/or area closures, technical measures, and tailored measures for target fisheries. Such measures should be developed by stakeholder consultations, considering the overall mixed fisheries context."

The EC's regulation stating catching opportunities for 2015 identified A.radiata among a number of elasmobranch species for which catch is prohibited. The reference fleet data for 2014 (Table 3.4.2.1) shows that a starry ray was caught and discarded in this fishery (prior to it being recognised as a species where catch is prohibited), although it is not clear whether the species identification is correct, as the table refers to *Raja radiate*, yet the Council Regulation names Starry ray = *Amblyraja radiate*.

Seals

Both harbour seals and grey seals have been known to be captured incidentally in mobile gears, but the evidence available to the assessment team (Table 3.4.3.3 and Table 3.4.3.4) suggests that by-catch in this pulse trawl fishery is either very low or non-existent. It is highly likely that any impact is at a very low level relative to seal populations in the North Sea and northeast Atlantic, which are known to be increasing.

Harbour porpoise *Phocoena phocoena*

The harbour porpoise *Phocoena phocoena* is the smallest species of cetacean found in European waters, measuring around 1.3 - 1.5 metres in length and weighing 50 - 60 kg. The harbour porpoise is commonly seen in coastal areas, although it ranges over much of the European continental shelf. It is the commonest and most widely distributed of all cetacean species in northern Europe, favouring comparatively shallow, cold waters. There are seasonal concentrations of harbour porpoises. However, like the bottlenose dolphin, the species was once a regular visitor to the south coast of England and the southern part of the North Sea during the summer months, but then became a rare sight in these areas (Figure 22):

Figure 22 Distribution of harbour porpoise: dark blue = regular to light blue rare

Source: Seawatch Foundation

In several areas of Europe, populations seem to have declined or have been eliminated, notably in the eastern Channel, the Mediterranean and the Baltic Seas. It is thought that levels of accidental mortality in fishing nets in certain areas (for example the Celtic Sea west of Cornwall, and the central and southern North Sea) may be unsustainable.

The demersal pulse trawl fishing gears do not have significant potential for direct negative interactions with cetacean species. Harbour porpoises are much more likely to be affected by set nets than demersal mobile gears.

Allis shad *Alosa alosa*

The allis shad is found in the eastern Atlantic in waters bordering most of Europe and northwestern Africa. They primarily live at sea on feeding grounds and migrate to their spawning grounds between April and June once they are sexually mature. Populations have been reduced primarily by overfishing, pollution, and habitat destruction. The beam-trawl fishery is known to capture twaite shad, although estimated quantities are very low and, even if some of these fish are Allis shad (they are difficult to distinguish externally) and this were to continue with the pulse trawl (1 specimen is reported in the ETP monitoring in the pulse fishery), these are likely to be within acceptable limits.

Eel *Anguilla anguilla*

The European eel inhabits all types of benthic habitats from streams to shores of large rivers and lakes. Naturally found only in water bodies connected to the sea. Review of information supports the view that the European eel population as a whole has declined in most areas, the stock is outside safe biological limits and current directed fisheries are not sustainable. There is obvious decreasing of the stocks for all the continental native distribution area[7]. 11 specimens are reported in the ETP monitoring in the pulse fishery, which represents an acceptable level of bycatch for this CITES Appendix II species that continues to be commercially exploited.

Sturgeon *Acipenser sturio*

Sturgeon is a critically endangered anadramous species, according to ICES Red List, and CITES Appendix I species.: The only remaining spawning population in the Eastern Atlantic occurs in the Garonne drainage in France.[8] Five specimens were identified in the ETP monitoring in the pulse fishery.

Tope *Galeorhinus galeus*

Tope is considered highly vulnerable to overexploitation, as they have a low population productivity, relatively low fecundity and protracted reproductive cycle. Furthermore, unmanaged, targeted fisheries elsewhere in the world have resulted in stock collapse (e.g. off California and in South America). Tope are also an important target species in recreational fisheries; though there are insufficient data to examine the relative economic importance of tope in the recreational angling sector, this may be high in some regions. Currently there are no targeted commercial fisheries for tope in the NE Atlantic. Tope is taken as a bycatch in trawl, gillnet and longline fisheries, including demersal and pelagic set gears. Though tope is discarded in some fisheries, other fisheries land this species as bycatch.

ICES provided advice for this stock for the first time in 2012, stating “Based on ICES approach to data-limited stocks (ICES 2012b). ICES advises that catches should be reduced by 20%. Because the data for catches of tope are not fully documented and considered unreliable (due to the historical use of generic landings categories), ICES is not in a position to quantify the result. Measures to identify pupping areas should be taken”. Tope was not identified as present in the landings or discard data for the pulse trawl fishery. It was not part of the ETP monitoring programme in the pulse fishery organised by the CVO and described below.

CVO conducted a pulse trawl monitoring program in 2012, and part of that was a weekly 24-hour registration of 19 vulnerable species. About 25 vessels participated in the program (over half the fleet of 42 at the time) and in total more than 500 ETP forms over the course of 2012 were received.. The 25 vessels were a representative sample of the fleet, and would still be considered as such, even after the additional 42 vessels entered the fleet in 2014. The 25 vessels covered all major fishing areas, both large and small cutters, HFK and Delmeco pulse trawls and different harbours and/or POs.

In total, the catches of 19 species were monitored by the fishermen every week for 24 hours (see Table 3.4.3.2 for a summary of the results. All fishermen received an ETP-guide to help identify species. Only some of these 19 species are actually considered to be ETP species according to the MSC criteria.

Table 3.4.3.2: overview of registered catches of the species listed in Table 3.4.3.2 during 2012 by 25 pulse trawl vessels.(Species highlighted in blue correspond to those listed as ETP in Table 3.4.3.1)

Species (English)	Scientific name	Catches (specimens)	Comment
Eel	*Anguilla anguilla*	11	
Atlantic salmon	*Salmo salar*	0	
Harbour Porpoise	*Phocoena phocoena*	1	Dead already

[7] Fishbase.org

[8] Fishbase.org

Species (English)	Scientific name	Catches (specimens)	Comment
Spurdog	*Squalus acanthias*	82	
Shad	*Alosa alosa*	1	
Spotted ray	*Raja montagui*	7225 specimens + 1425 kg	Actual catches were higher, since some fishermen incidentally reported to have caught 'a lot' (thereby not specifying the amount)
Common seal	*Phoca vitulina*	0	
Grey seal	*Halichoerus grypus*	0	
Porbeagle	*Lamna nasus*	0	
Short-snouted seahorse	*Hippocampus hippocampus*	0	
Common seahorse	*Hippocampus guttulatus*	0	
Ocean quahog	*Arctica islandica*	15	
Basking shark	*Cetorhinus maximus*	0	
Thornback ray	*Raja clavata*	7669 specimens + 1032 kg	Actual catches were higher, since some fishermen incidentally reported to have caught 'a lot' (thereby not specifying the amount).
Sturgeon	*Acipense sturio*	5	
Common skate	*Dipturus batis*	17	
White skate	*Rostroraja alba*	177	Catches of white skate have been recorded only four times during the whole year by two different vessels (from Texel). Fishermen from the isle of Texel do not believe that this information is correct, they think that this was a different species and that something went wrong in the registration.
Angel shark	*Squatina squatina*	0	
Sea lamprey	*Petromyzon marinus*	3	

Source: Client 2015

In March 2015 the CVO enhanced its ETP logbook scheme across 27 participating pulse vessels (still accounting for over 1/4 of the fleet). The results given in table 3.4.3.3 are preliminary and due to the limited time-frame do not yet represent ETP interactions of the pulse fleet in general. The following observations can be extracted from the data collected so far (March-June 2015): 27 vessels collected information during 157 fishing trips (= weeks); ETP interactions (other than thornback ray) were found for 9 (out of 27) vessels. All three harbour porpoises were recorded as being in a state of disintegration when removed from nets.

Table 3.4.3.3. ETP interactions recorded between March and June 2015.

Species nr.	*Species name*	*Amount caught*	*During how many hauls?*
1	*Harbour porpoise*	3	3
4	*Spurdog*	43	33
5	*Tope*	86	34
10	*Starry ray*	85	14
13	*Undulate ray*	9	6
16	*Allis shad*	2	2

Source: Client, July 2015

Based on the above information, there are no ETP species where the direct capture by pulse trawl vessels is expected to be at unacceptable levels.

Other potential impacts of pulse trawl on ETPs

Most trawl fisheries have at least some potential to interact with ETP species. The ETP interaction profile for each gear type varies and is greatly influenced by the manner in which it is utilized. Factors such as frequency of use, duration of deployment, season, and location all play a role in defining a gear type - ETP interaction profile.

The effect of electricity on marine species is the subject of several recent studies. Many of these were reviewed in a recent PhD by Soetaart, 2015.

For marine mammals, the available evidence (and anecdotal information) suggests the direct impact of pulse gear would be negligible given their ability to avoid the gear and the limited extent of field strength beyond the gear itself.

There have been no experiments specifically on the elasmobranchs identified as ETP species. Inevitably ETP species are generally not selected for experimental observation The extent to which studies on one species can be extrapolated to another is limited. However, a study by Desender et al (2015) showed the effect of pulse on both Thornback rays and lesser-spotted dogfish to be minimal, indicating that, with correct handling, the fishery should be able to release these species back to the sea live.

An EU-funded research project[9] to study the effect of pulse trawl on the marine environment, to be conducted by scientists at IMARES was being designed at the time of the site visit.

The CVO Management Strategy states that CVO will actively inform the pulse trawl fishermen on voluntary measures to increase survival of sharks and rays in the North Sea (in case of catches) and will encourage them to implement these. The CVO started this in June 2015, by distributing information on this topic through the newsletters and websites of both Visned and Dutch Fishermens Association and the CVO. Additional communication on this topic will coincide with the publication of an updated ID-guide for rays and sharks which is scheduled for the autumn of 2015. The protocol for ETP registration states that ETP species, in case of catches, should be returned back to sea alive as much as possible.

The CVO has recently designed and is currently implementing a pulse fishing specific Code of Conduct (CoC), which is being rolled out across the pulse fishing fleet. This CoC is recognized as a positive move as it includes reference to limiting wider ecosystem and environmental impacts, for example through habitat management, participation in research, ETP recording, measures for increasing the survival of rays and sharks, as well as clear restriction on actual pulse gear technology (such as pulse strength, no tickler chain). The CoC generally aims to increase awareness and encourage responsible behaviours amongst fishermen, in order to minimize impacts of the fisheries on the wider ecosystem.

[9] Associated with the EU derogation to allow a further 42 Dutch vessels to convert to Pulse trawl, based on Article 14 of the new CFP (Regulation (EU) No 1380/2013).

3.4.4 Habitat

The North Sea can broadly be described as having a shallow (<50 m) south-eastern part, which is separated by the Doggerbank (Figure 23) from a deeper (50–100 m) central part running north along the British coast. The central northern part of the shelf gradually slopes down to 200 m before reaching the shelf edge. Another main feature is the Norwegian Trench running in the east along the Norwegian coast into the Skagerrak with depths up to 500 m. Further to the east, the Norwegian Trench ends abruptly, and the Kattegat is a similar depth to the main part of the North Sea.

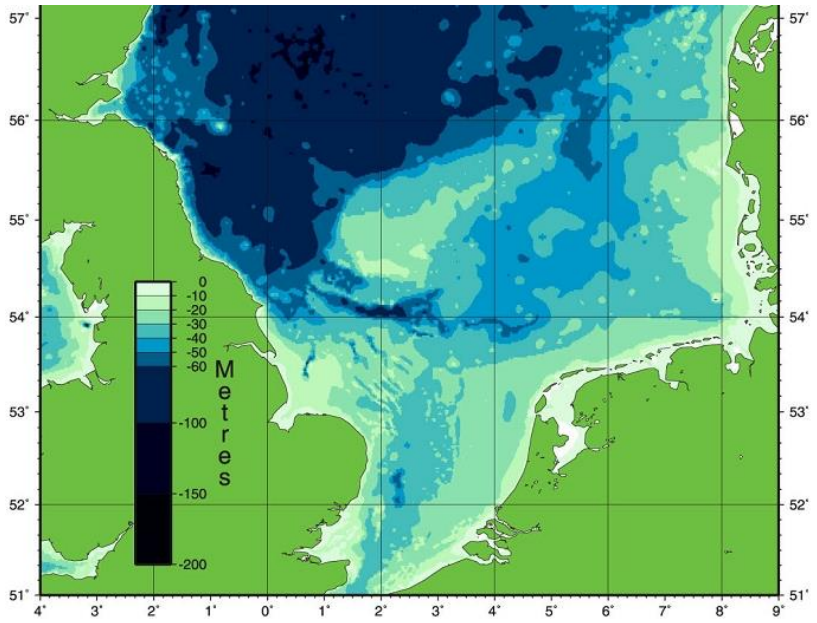


Figure 23 General bathymetry of the North Sea

Source: www.doggerbank.nl

The actual sediment types and distribution have been mapped, IMARES produced a detailed habitat map as part of survey works (Figure 24).

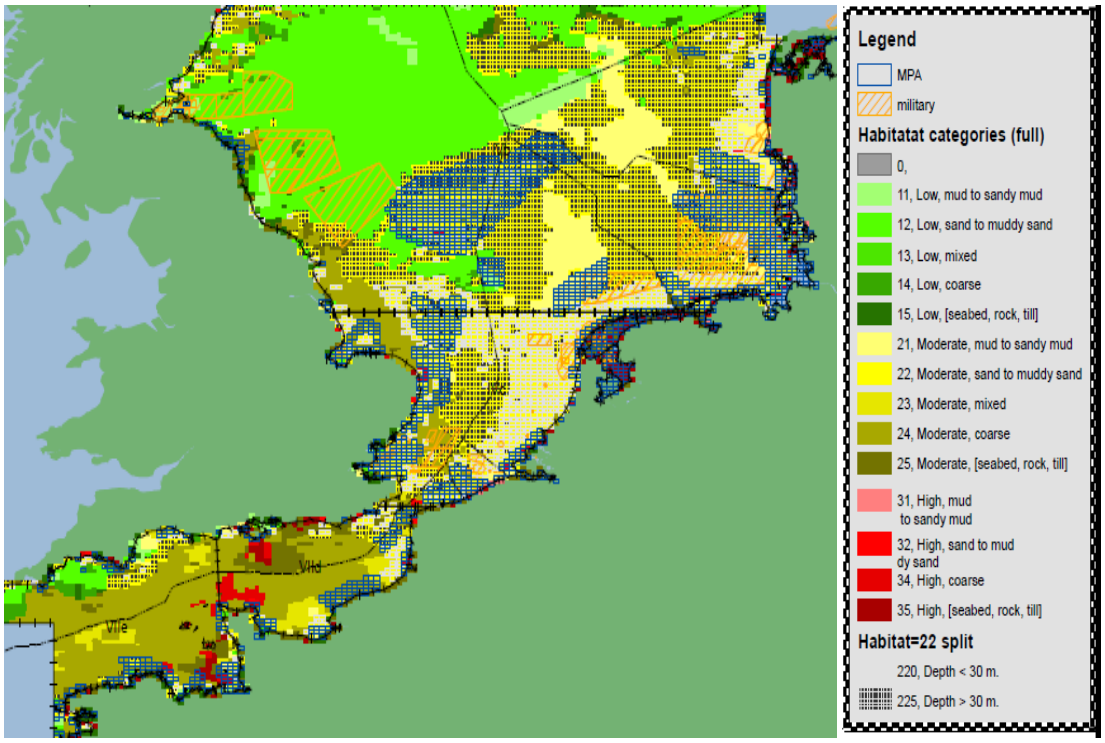


Figure 24 North Sea benthic habitats

Source: IMARES 2015

As can be seen from Figure 24, the North Sea seabed is primarily sandy, muddy sand interspersed with gravel and rock reefs. It was not possible to locate a map of VME's, such as biogenic reefs, specific for the area where this CVO pulse fishery operates. It may be that such maps don't exist, or such reefs are not found in the area. If they were in the area, it can be reasonably assumed that they would have been flagged up for Natura 2000 protection (see figure 26).

Protected Areas

In managing potential habitat and ecosystem impacts in the North Sea, industry and management authorities are guided by commitments to a number of relevant conventions and European Directives, such as:

OSPAR Biological Diversity and Ecosystems Strategy which is concerned with all human activities which can have an adverse effect on the protection and conservation of the ecosystems and the biological diversity of the North East Atlantic. The Strategy (i) sets ecological quality objectives in support of the ecosystem approach to the management of human activities, (ii) requires assessments of species and habitats that are threatened or in decline, (iii) the development of an ecologically coherent network of marine protected areas and (iv) the assessment of human activities which may adversely affect ecosystems and the development of programmes and measures to safeguard against such harm.

ASCOBANS ASCOBANS was concluded in 1991 as the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) under the auspices of the Convention on Migratory Species (CMS or Bonn Convention) and entered into force in 1994. Denmark is a signatory nation.

Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds Directive 1979 and its amending acts aim at providing long-term protection and conservation of all bird species naturally living in the wild within the European territory of the Member States (except Greenland).

Council Directive 92/43/EEC and its amending acts on the conservation of natural habitats and of wild fauna and flora came into force on 21 May 1992. The central aim of the Directive is to conserve biodiversity across the area of the European Union through a coherent network of Special Areas of Conservation (SACs).

Marine Strategy Framework – Directive 2008/56/EC. The Marine Directive aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. It is the first EU legislative instrument related to the protection of marine biodiversity, as it contains the explicit regulatory objective that "biodiversity is maintained by 2020", as the cornerstone for achieving GES. The Directive enshrines in a legislative framework the ecosystem approach to the management of human activities having an impact on the marine environment, integrating the concepts of environmental protection and sustainable use.

CFP – EU 1380/2013. The CFP aims to ensure that fishing and aquaculture are environmentally, economically and socially sustainable. To this day, the impact of fishing on the fragile marine environment is not fully understood. For this reason, the CFP adopts a cautious approach which recognises the impact of human activity on all components of the **ecosystem**. It seeks to make fishing fleets more selective in what they catch, and to phase out the practice of discarding unwanted fish.

CBD - the Convention on Biological Diversity was signed at the UN Rio Conference on Environment and Development (1992). This aims conserve biological diversity, encourage sustainable use of its components and the fair and equitable sharing of the benefits arising from the use of these resources.

National governments are currently in the process of identifying and nominating offshore Special Areas for Conservation (SACs) and Special Protection areas (SPAs) under the EU Habitats and Birds Directives (for The Netherlands, FIMPAS:www.noordzeenatura2000.nl). It is intended that these and other sites within the North Sea will eventually build into an ecologically coherent network of protected areas, the Natura2000 network.

Natura 2000 sites have not been designated specifically for general marine conservation purposes, but to protect habitats and species listed under the EU Habitats and Birds Directive. The aim is for areas protected under Natura 2000 either not to deteriorate or to improve in relation to their current state, for which monitoring is required now and in the future.

A number of sand banks across the North Sea qualify for protection under the EU Habitats Directive, mainly along the UK coast, the approaches to the Skagerrak, and the Dogger Bank. Extensive biogenic reefs of *Lophelia* have recently been mapped along the Norwegian coastline in the eastern Skagerrak, while Sabellaria reefs have been reported in the south, although their distribution and extent is not known.

Of particular relevance to the UoCs is the designation, by the UK, Dutch and German governments, of the Dogger Bank on the basis of the habitat 'Sandbanks covered all the time', and where harbour porpoise and grey and common seals are nominated species. The Cleaver Bank, lying some 160 km NW of Den Helder, is an example of an "Open sea reef" SAC,

Figure 25 presents the location of Dutch Natura 2000 sites.

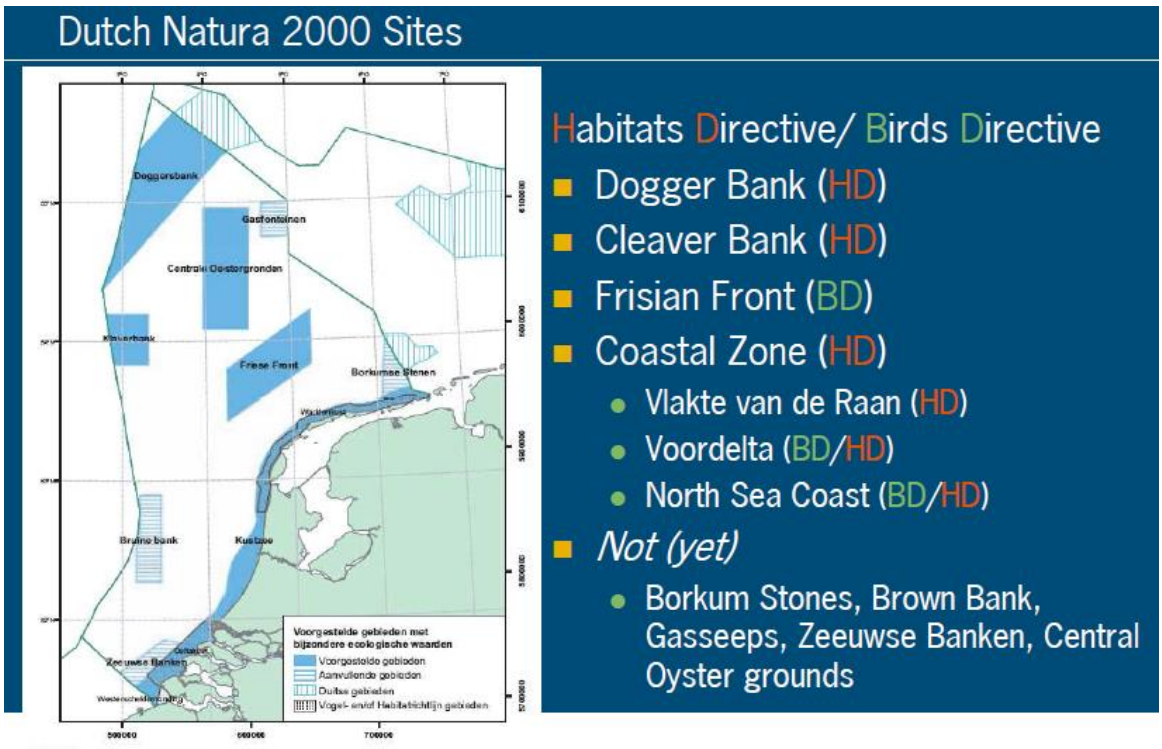
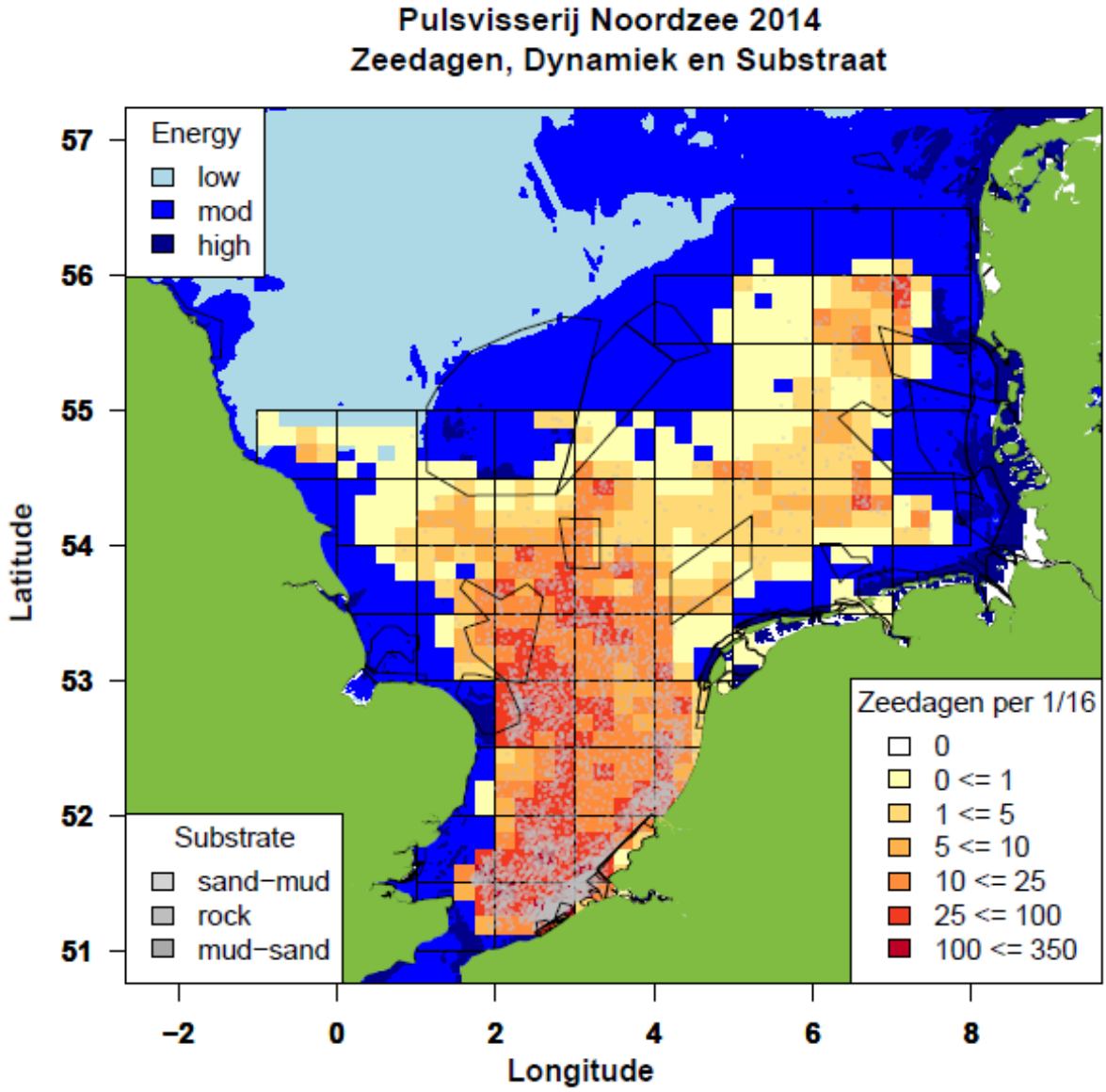


Figure 25 Location of Dutch Marine Protected Areas

Source: Jak et al 2009

Figure 26 shows where the pulse fishery was fishing in 2014, in relation to Natura 2000 sites as well as underlying substrate. The map shows that fishing does occur on the Dogger Bank and Cleaver Bank, and is increasingly concentrated towards the SW North Sea. Much of the CVO pulse trawl fishery targeting flatfish occurs on sandy seabeds, while flatfish may also be targeted on muddy seabeds, sandy gravel and gravel or stones to a lesser extent.



Source: Client, July 2015

Figure 26 VMS tracks, substrate and Natural 2000 sites

There are several sources of information in relation to seabed habitats in the North Sea and there is a good understanding of the habitats where the fishery is most concentrated. Demersal trawling is spatially the most widely distributed means of fishing for demersal species. Seabed habitats within this area form a mosaic that is dominated by sands and coarser sediments such as gravely sand, sandy gravel and stones. Some smaller areas of mud and rock may occasionally also occur within the area fished, especially close to the Norwegian Trench. Management of potential impacts is facilitated in part through effective monitoring of the spatial and temporal aspects of the trawl fishery, although there could be more comprehensive information in relation to the seabed habitats and communities that may be associated with the areas that are most intensively fished. Available habitat maps for the area tend to be broadscale and may not record all areas of sensitive or vulnerable communities.

As all vessels operate with mandatory Vessel Monitoring Systems (VMS), management authorities are able to establish the location and frequency of fishing in relation to these habitats. At the request

of the client, IMARES analysed fishing activity for pulse trawl and the beam trawl vessels in relation to known habitats. The results are presented in table 3.4.4.1 and show that 98% of the pulse trawl effort is on moderate energy habitat types. Approximately ¾ of the total effort is applied in the habitat area with moderate dynamics and sand to muddy sand sediment (code 35). This habitat area covers 55% of the whole North Sea surface (Machiels, 2015).

Table 3.4.4.1 Fishing effort (kw days at sea

			Gear type	
Code	Substrate	Dynamic	Beam trawl	Pulse trawl
00	0 rest	0 rest	127000	12000
11	1 Coarse sediment	1 High	15000	15000
13	3 Mud to sandy mud	1 High	23000	7000
15	5 Sand to muddy sand	1 High	121000	45000
25	5 Sand to muddy sand	2 Low	437000	117000
31	1 Coarse sediment	3 Moderate	3127000	2194000
32	2 Mixed sediment	3 Moderate	19000	7000
33	3 Mud to sandy mud	3 Moderate	1468000	173000
34	4 Rock or other hard substrata	3 Moderate	17000	3000
35	5 Sand to muddy sand	3 Moderate	19787000	8113000
ALL			25141000	10686000

Source: IMARES

The pulse trawlers in 2014 fish in sand to muddy sand and coarse sediment habitat and slightly less in mud to sandy mud sediments. The same areas area fished by beam and pulse trawl, but pulse favour somewhat softer substrate (enabled by the comparatively lighter gear). As this is a relatively new development, it is not certain that these differences show in 2014 (when many vessels changed to pulse trawl during the year) will persist.

With the decommissioning of beam trawl vessels and the switching to pulse gear mid 2014, the fishing impact of the pulse gear is shown to be substantially lower compared to the beam trawlers in 2010.

On average 32% of the area of all NS habitats is fished by beam trawlers and 23% by pulse trawlers. The coverage of the habitats moderate energy & sand to muddy sand substrate (code 35) and moderate energy & mud to sandy mud substrate (code 33) is higher than the average for beam trawling. Pulse trawling shows a coverage higher than 23% in the same habitat type areas (Machiels, 2015).

Effects of fishing gear on habitat

A key development in the pulse trawl is the use of electricity, which creates a response from the target species. There are therefore two potential habitat impacts of the gear to consider; the physical impacts from the trawl (see below) and also the impact of electricity on the benthic habitat features (see section 3.4.6).

Physical impact of the pulse trawl on benthic habitats

Animals and plants living on and in the seabed are adapted to the naturally occurring levels of seabed disturbance that occur in their habitat. Animal communities that are well adapted to high rates of mortality and natural disturbance characterize shallow tide-swept and wave-impacted sandy habitats. As a consequence, these communities show greater resilience to accommodate additional sources of disturbance such as fishing disturbance. Conversely, deep and stable seabed habitats are often characterized by slow-growing, habitat-modifying species for which bottom fishing can have major and long-term impacts on biomass and diversity. Trawling may affect seabed habitats and communities by removing boulders and stones and flattening relief.

Mobile demersal fishing gears are known to have significant potential to impact seabed biological communities. Impacts are generally greatest for sensitive communities such as corals, burrowing mega fauna and seapens, all of which may be slow-growing and long-lived. Long lived and slow growing species tend to be removed by multiple passes of trawls or by the effects of sedimentation as each pass of the net re-suspends sediment which then may settle on and smother sessile fauna. In this way, large, long lived and slow growing fauna may gradually be replaced by smaller, short lived and abundant populations of fast growing organisms which have a greater capacity for recovery through rapid reproduction and re-colonisation.

Whilst these relationships are relatively well understood, it remains a challenge to directly compare seabed disturbance caused by bottom-towed fishing gear with the natural disturbance of the seabed as different metrics are used to measure these difference sources of disturbance.

The effects of trawling on the benthic habitats have been studied over many years. There is extensive literature documenting this impact over many years. It is well established that trawling alters the structure and biota of the benthos by scraping or ploughing the seabed, re-suspending sediment, physically destroying bed-forms, and removing, scattering or damaging benthos (Collie et al. 2000, Kaiser 1998, Kaiser & de Groot, 2000, Jennings et al. 2001, Trimmer et al. 2005, Hiddink et al. 2006). However, the depth and magnitude of disturbance vary greatly with gear type, the intensity of fishing and sediment characteristics, and negative impacts of trawling are lowest in areas subject to high levels of natural disturbance such as the southern North Sea and its coastal margins (Hall 1994, Jennings et al. 1999; Kaiser 1998; Kaiser et al. 1998, Hiddink et al. 2006; Kaiser et al. 2006). Trawling principally affects benthic macrofauna (both infauna and epifauna), while smaller-bodied infauna tend to be less vulnerable (Bergman & van Santbrink 2000, Jennings et al. 2002). Organisms may also be damaged by trawling and subsequently scavenged by other organisms (Kaiser & Spencer 1994, Kaiser & Ramsay 1997, Bergman & van Santbrink 2000, Groenewold & Fonds 2000). A less well-understood aspect is that trawling disturbance can alter the biogeochemical functioning of the sediments and overlying waters (Riemann & Hoffman, 1991, Duplisea, et al. 2001, Trimmer et al. 2005, Allen & Clark, 2007).

In 2013, Teal et al (2014) conducted an experiment to compare the impact of trawl gear vs pulse gear on the underlying seabed and benthic organisms. The key findings included:

- Beam trawls were shown to penetrate deeper into the sediment than the pulse trawl;
- The benthic data revealed large variability between stations and it was difficult to detect an effect from fishing. Whilst overall biomass did decrease following (beam trawl and pulse trawl) fishing, this reduction was also found in the reference area.
- There were no obvious consistent patterns of fish trawling effect on the densities of individual species.
- Based on various life history traits, the recorded benthic species were assigned to one of three categories describing their vulnerability to trawling: resistant to trawling, vulnerable to trawling, or intermediate. Of the three categories, the highest densities were found in the resistant category, which is likely to explain the lack of trawling effect observed;
- The pulse and conventional beam trawl were shown to mobilise similar quantities of sediment, but the pulse trawl had higher values for more particle size bins. Total concentrations of re-suspended particles were also higher for the pulse at 25 and 45m behind the beam.
- The reduction of dissolved oxygen in the water column following the trawl of a pulse and that of a conventional beam trawl was similar, and oxygen levels appeared to revert back towards the baseline levels soon after trawling.
- Analysis of infauna and sediment characteristics is still ongoing. Sediment profile image analysis is also ongoing pending software development for image analysis.

In considering whether fishing results in ‘serious or irreversible harm’ to a habitat, it is important to understand the recoverability of that habitat from trawl disturbance. Hiddink (2014) used empirical data to then model the recoverability of different habitat types in the Southern North Sea from disturbance by beam trawl gear. The model considers the penetration of the gear and the frequency of trawl disturbance (the same method described in the peer-reviewed Hiddink, 2006 & 2007).

The recovery time to reach 80% of the values with no trawling (in terms of production, which could be considered a proxy for habitat function) averaged across all habitats was 2.7 years. The same recovery time of 2.7 years was found for sand to muddy sand, the habitat accounting for 78% of pulse trawl effort in 2014.

While the evolution from beam trawling to pulse trawling means that a comparison with beam trawling is inevitable, pulse trawling must be assessed in its own right. Not least because to date beam trawling has not been certified under the MSC and therefore does not provide a precedent or benchmark for comparison in relation to the MSC standard.

Preliminary results of BENTHIS[10], an EU funded study on the pulse trawling impact on European Seas, showed that there is no significant decrease in biomass benthos due to trawling (both tickler and pulse trawl), but it appears to indicate that the use of pulse trawl reduces bycatch in undersized fish, and reduced discarding of benthic invertebrates.

CVO Fishery related data

An analysis by IMARES of the 2012 pulse trawl monitoring programme[11] (Rasenberg 2014) showed the catch to consist of debris (34%) and benthos (18%) (Figure 27). However, comparison between the self-sampling and observer programme showed significant difference in the catch composition: the amount of benthos & debris, sole discards and cod landings are significantly higher in the self-sampling program. The differences in results may be due to the fact that fishing took place in other times and in other areas, which indicates that a direct comparison can only be used as a general observation.

Benthos was not defined to species level, but the percentage indicated a continued effect of benthos disruption, similar to non-pulse gear. The benthos catches of the pulse observer program (2012, >300hp) are compared with the benthos catches of the beam trawl fishery (2012, >300hp) from the Data Collection Framework program. No self-sampling data on species level is available. The results given, showed that the numbers of starfish and crab caught in the pulse trawl trips were lower than in the conventional beam trawl trips. The pulse vessels caught 16% of the number of starfish caught with the conventional beam trawl and 42% of crabs. The numbers of caught starfish and crabs are good indicators of the caught benthos quantities in the pulse and beam trawl fishery; these results indicated that the pulse fishery caught less benthos compared to the beam trawl fishery at that time.

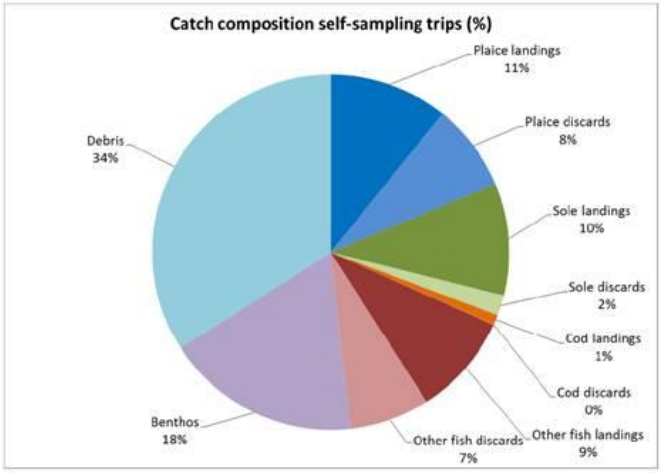


Figure 27 Catch composition from pulse self-sampling trips

[10] Rijnsdoorp A, etal, 2015. Ppt presentation on 'Trawling Impact European Seas' IMARES.

[11] The catch monitoring program consisted of 25 vessels participating in a self-sampling program and ten observer trips on different vessels and fishing grounds throughout the year of 2012. In 2011, Derogation permits were given by the EU under the condition that more information on the effects of pulse fishing would be collected. For this reason, the fishing industry started a catch monitoring program with the scientific support of research institute IMARES in December 2011.

Source: Rasenberg 2014

An analysis[12] of comparative fishing trials between pulse trawl and beam trawl gear by van Maarlen (2011) showed that the most abundant benthic species in the catches were brittle star (*Ophiura ophiura* L.), swimming crab (*Liocarcinus holsatus* L.), common star fish (*Asterias rubens* L.) and hermit crab (*Pagurus Bernardus* L.). When adding all catch components TX68 caught less than TX36 compared to GO4. The pulse trawls had a higher catch of sea potato (*Echinocardium cordatum* L.), The vessels with pulse trawls caught fewer target species, but also less immature and non-target fish, and fewer benthic species than the vessel with tickler chains on these fishing grounds and in this period. Van Maarlen pointed out, however, that Pulse trawls are continuously improved, and that therefore this means that the conclusions of that study should be restricted to the technical state of the gears as they were tested in May 2011.

3.4.5 Ecosystem

The North Sea is one of the most studied seas in the world, with a relatively long time series of observational data (ICES 2015). Indeed, data from the plaice, cod and herring fisheries operating in the North Sea were used to develop the scientific theory of fishing in the first half of the 20th century (Beverton and Holt, 1957). Concern over the state of these fisheries was the principal driver behind the inception of the International Committee for the Exploration of the Sea (ICES), which co-ordinates much of the fisheries research in the north-eastern Atlantic. Monitoring programmes for most ecosystem components (plankton, fish, seabirds, marine mammals), are frequently co-ordinated through OSPAR and ICES assisted by various EU Framework programmes and networks such as EurOceans (www.eur-oceans.eu). Availability of data varies nationally, with some of the best examples such as MESH covering only a portion of the North Sea. Monitoring is also co-ordinated through NOOS (North Sea Ocean Observing System; www.noos.cc/) and quarterly reports linking oceanographic conditions and fisheries were produced by ICES as part of the North Sea Pilot Project (NORSEPP), but this activity ceased in 2008.

In 2006, ICES conducted a pilot study on integrating ecosystem indicators in the North Sea (ICES, 2007) with a view to establishing a regular ecosystem status assessment. A number of oceanographic models have been developed for the North Sea, several of which have been coupled with particle-tracking schemes to predict the dispersal paths of passive tracers such as fish eggs (Heath and Gallego, 1998). Some of these physical models have also been coupled to biological models of varying complexity, which can be used to explore the interactions between natural ecosystem variability, biology and anthropogenic activities. These coupled physics-biological models are generally only available in marine institutes and universities, and most of them represent only the lower trophic levels (phytoplankton and, in some cases, zooplankton). The higher trophic levels have, however, been included in mass-balance models such as an ECOPATH reconstruction of the possible foodweb before heavy fishing (Mackinson & Daskalov, 2007). The ICES Working Group on Multispecies Assessment Methods has recently begun to compare results from North Sea Ecopath and Ecosim models with results from multi-species VPA assessments.

An ecosystem approach to management is a policy aim of the European Union, the Marine Strategy Framework Directive, adopted in 2008 (Directive 2008/56/EC). This Directive aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. It is the first EU legislative instrument related to the protection of marine biodiversity, as it contains the explicit regulatory objective that "biodiversity is maintained by 2020", as the cornerstone for achieving GES. Furthermore, the Directive enshrines in a legislative framework the ecosystem approach to marine management, thus moving the focus away from considering fisheries in isolation towards ecosystem processes and how they are affected by anthropogenic activities. Around the North Sea coast there are a number of long-running time-series monitoring various oceanographic parameters including water temperature, salinity, phytoplankton and zooplankton. General summaries of geography,

[12] This is based on comparative fishing trials conducted in May 2011 (week 19) on commercial beam trawlers fishing with conventional tickler chain beam trawls and two pulse trawl vessels. The three vessels fished side-by-side as much as possible.

geology, hydrography, nutrient status, biology, anthropogenic pressures and contaminants of the North Sea can be found in OSPAR (2000) and Rees et al. (2007).

CEFAS recently published an ecosystem model of the North Sea (Mackinson and Daskalov, 2007), which documents the trophic level and predator-prey relationship between 68 different species, from cetacean to polychaete. The model split the benthic and pelagic pathways which allowed the albeit simple representation of the critical dynamics of the microscale processes that are pivotal in linking the pelagic and benthic systems and may have considerable bearing on production regimes in the marine environment (Figure 28).

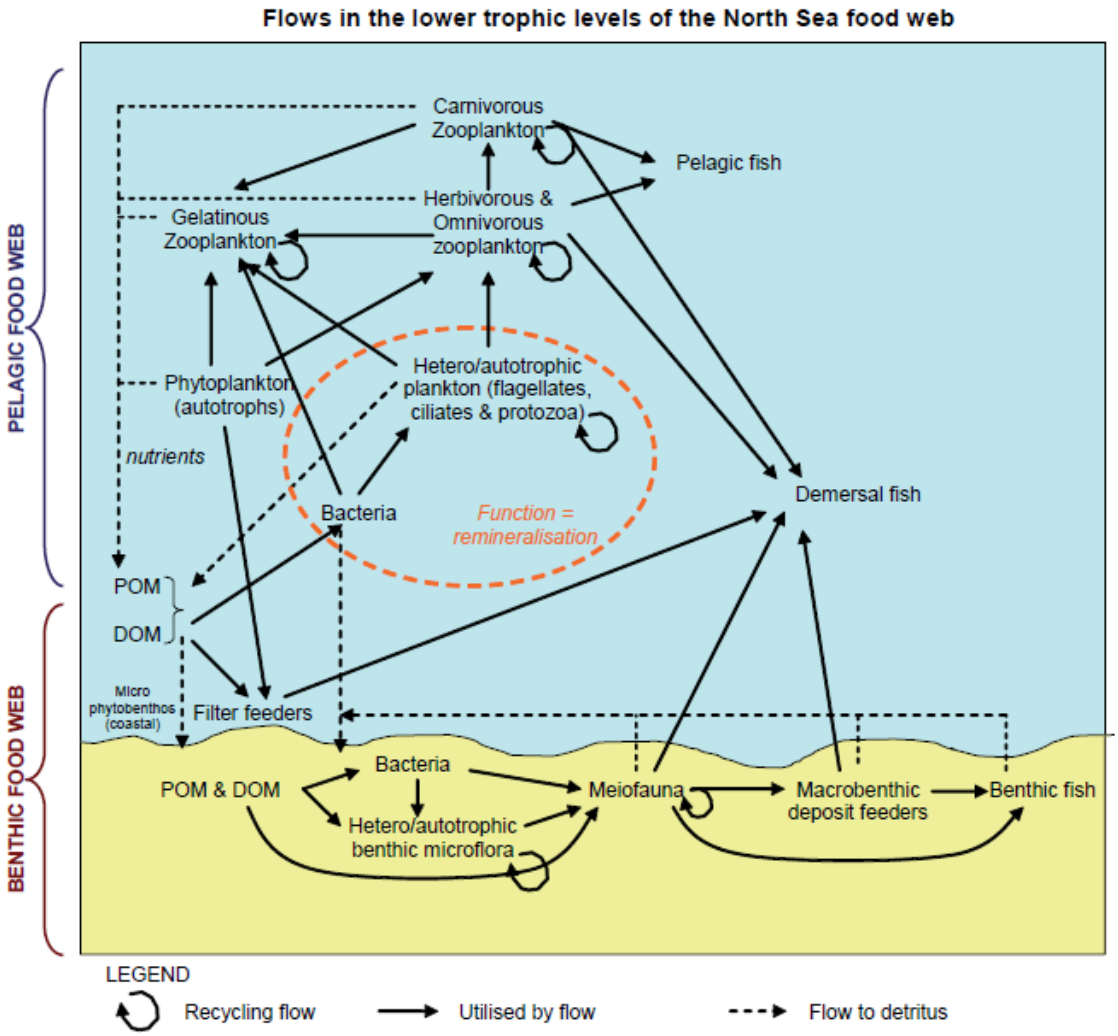


Figure 28 Flows in the lower trophic levels of the North Sea food web

Source: Mackinson et al 2007

Mackinson et al (2007) reviewed the benthic invertebrates, both epifaunal and infaunal, in the North Sea, as part of the modelling project, including a variety of phyla that live interstitially. There are, as yet, no studies on how these animals are affected by electric pulse passing over at regular intervals over a period of time. Benthic organisms, including mobile benthic organisms (nephrops, shrimp, crabs), make up a considerable part of the diet of rays and skates, including protected species. Many of the flatfish species are benthivorous, sole for eg. feeds on polychates and meiofauna.

3.4.6 Effect of the pulse trawl on marine organisms

As described in earlier sections, impacts by the pulse trawl can be considered as resulting from the physical trawl gear (described in the earlier sections), but the introduction of an electrical pulse may also result in further impact on marine organisms.

Studies have been undertaken in recent years to explore the effect of pulse trawling on marine organisms. There is an ICES working group now on electric fishing, WGELECTRA, which published an update on relevant studies in 2014 (ICES 2014f). The major findings were as follows:

- The pulse stimulation tested in a uniform field did not result in an increased mortality or macroscopic lesions in sole, cod, brown shrimp and rag-worm.
- No mortality or spinal injury, but minor haemorrhages and point bleedings were found in plaice, sole, cod, armed bullhead, and bull-rout.
- Some effect was found on egg stages of sole, but no real effect on larval stages.
- Lesions were found in dab under pulse stimulation, but no clear differences between treated fish and reference fish could be distinguished.
- The results of tank tests on cod under pulse stimulation varied considerably, which was attributed to differences in rearing of the fish.
- A catch comparison between a new shrimp pulse trawl (12 electrodes and 11 bobbins) and a conventional shrimp trawl (36 bobbins) showed that shrimp landings remained the same, with less undersized shrimp and much less bycatch.
- Electrofishing on razor clam in Scottish waters has minimal effect on the seabed compared with conventional dredge and trawl fisheries; immediate effects on non-target species are non-lethal and effects on invertebrate behaviour are short term, but restrictions on fishing effort may be needed in view of high efficiency of electrofishing.

Several laboratory studies have recently been conducted to study the effect of electric pulse on a number of species. A presentation on ‘Pulse fishing in practice’ by Bart Verschueren at the International Dialogue Meeting on Pulse Fisheries Scheveningen-2/07/2015 highlighted different behaviours by animals in response to a pulse stimulus, either cramping (as in flatfish) or fright (as in shrimp). The response can be varied, depending on the pulse strength and/or duration.

Desender et al (2015) evaluated the effect of pulse exposure on several species, and found no major harmful effects. The effect of pulse on different life stages was studied on cod and sole, and did not appear to show any significant impact on larval survival as well as morphometrics. The effect of pulse was also studied on electrosensitive elasmobranchs, including Thornback Ray and Lesser-spotted dogfish. After 1 & 14 days there was no mortality, no macroscopic damage, no microscopic injury and no spinal injury. The analysis of blood samples is ongoing. Functionality of prey detection was also tested and no significant impact in bite response was noted.

A study by de Haan (2011) found that cod length appeared to determine the extent of the effects of pulse: smaller cod (12-16 cm) showed no spinal damage, larger cod (40-60cm) showed an increased chance for spinal damage. All juveniles (involving 12 trials and a total of 168 specimen) survived the harshest condition (highest possible amplitude in the nearest possible range of a conductor in a horizontal plane, along the conductor and perpendicular to the centre of a conductor) even after 4 exposures in a row. However, it is not yet possible to translate this into long-term survivability. Differing cod morphology and other fish related parameters (such as locality, farmed, laboratory, etc) played a considerable part in the outcome of these studies, making it more difficult to draw common conclusions, when trying to tease out effects of electric pulse on these fish (de Haan et al, 2013).

Other studies have looked at safety margins in shrimp, sandworms, sole and cod. Although there was no increase in mortality, macroscopic injuries and histological injuries, immunological effect on shrimp was detected in the form of included viral bodies when shrimp were exposed to >200v/m for 2 seconds (Soetaert et al 2014).

A laboratory study on mature lesser spotted dogfish (de Haan et al. 2009). In the 14 days’ observation period after the exposures no aberrant feeding behaviour was observed. No evidence was found of a relationship between the degree of exposure and the production of eggs. The dogfish showed a

tendency to accelerate upward in response to the electric exposures, which may be relevant since, in field situations, dogfish have been observed entangled in the meshes of the top panel of the full-scale pulse trawl. A study on the survival rate of lesser-spotted dogfish in Spanish trawler fisheries (Rodriquez- Cabello et al., 2005) showed that commercially discarded lesser-spotted dogfish have a survival rate of 78 %. Combined with the results of the current study, (no evidence of increased likelihood of injury or mortality as a result of exposure to the stimuli) it could be inferred that lesser spotted dogfish caught in the pulse trawl have a reasonable chance of survival as long as the fish do not become entangled in top panel meshes.

A not yet published study by de Haan et al (2015) [13] appeared to show that the electric pulse does not leak beyond the perimeter of the pulse gear. It might therefore be expected that any observed or potential effects are limited to the footprint of the fishery.

Soetaert (2015) reviewed several recent studies of relevance to the benthic invertebrates associated with the habitats fished, the review found that "previous exploratory studies with a range of invertebrate species concluded that the impact of electrotrawls on invertebrates is expected to be smaller compared to conventional beam trawls (Smaal & Brummelhuis, 2005; van Marlen et al., 2009). The presented elaborate studies with brown shrimp and ragworm in an experimental set-up and brown shrimp in a veracious set-up with commercial wire-shaped electrodes could not refute this statement, but indicate that caution is warranted. …shifting the focus more to the field is recommended because that may reveal unwanted in-situ interactions or possible long-term or indirect effects on commercial fish species, benthos and sensitive gadoid fish that will be difficult to simulate in the laboratory (Soetaert, 2015). Further studies are required to understand and evaluate the effects of repeated exposure, ulceration potential and long-term effects.

The fishery study group Pulse and SumWing (part of the fishery study group Flatfish) asked IMARES and LEI to make a summary of the available knowledge and knowledge gaps on the effects of pulse fishing. This resulted in the report of Quirijns *et al*. of 2013. The Dutch ministry of Economic Affairs asked IMARES to update this report in 2015 with the latest results from research. Quirijns et al, 2015 provides an up to data account on knowledge on the effects of pulse stimulation of marine organisms and marine ecosystems, along with remaining information gaps. The summary of research findings are as follows:

• _Dab: no lesions were observed in the fish, neither analysed directly after, nor when analysed five days after the exposure to electrical stimulation.

• _Preliminary sampling of roundfish caught by commercial pulse trawl gear showed that about 10% of the cod and 2% of the whiting showed a fracture of the vertebral column.

• _Cod: laboratory experiments showed that the probability of fractures in spinal column occurs in marketable sized fish but not in cod that are small enough to escape through the meshes of the net. The injury probability increase with field strength and decrease with pulse frequency;

• _Dogfish: behavioural response but no injuries observed when exposed close to electrodes. Effects on the proper functioning of their electro receptor organs after exposure to the electric fields was not studied;

• _Benthic invertebrates: some species did not respond to pulse (spisula and starfish); other species did (razor clam, shrimp, common crab and rag worm). Mortality increase, if at all, was low (3-7% for ragworm, common crab and razor clam), and food intake and behaviour recovered after exposure;

• _Marketable plaice and sole: the pulse gear has similar catch levels of marketable sole as the conventional beam trawl, but lower ones of marketable plaice;

• _Plaice and sole quality and survival: the species caught with pulse trawl are damaged to a lesser extent than those caught with a conventional beam trawl. A significant higher survival rate for plaice was found for the pulse trawl after 192 hours of observation in comparison with a conventional beam trawl;

• _Discards: the catch level of undersized fish and benthos that are usually discarded is distinctly lower (30-50% fewer fish discards, 48-73% fewer benthic species);

[13] Haan de et al., 2015, submitted to IJMS - paper not yet publicly available.

• _Fuel consumption: a pulse trawl is towed at a lower speed than the conventional beam trawl, resulting in reduced fuel consumption and emissions of $C0_2$ and other greenhouse gases.

• _Penetration of gears: Seabed bathymetry changes between ~ 1 and 2 cm and is further increased by higher trawling frequencies. The tickler-chain trawl affected seabed bathymetry to a greater extent than the pulse trawl, when comparing depth differences at 320 kHz. Depth differences were < 6 mm for both gears at a 25% probability (of occurrence of a certain depth difference), but the changes to the seabed bathymetry at a 50% probability were up to 20 mm for tickler-chain trawling and 14 mm for pulse trawling.

• _Shrimp and ragworm: No significant increase in mortality or injuries. Shrimp demonstrates tail flip (depending on frequency) and the ragworm demonstrates squirming reaction (independent of the frequency). Increase in severity of virus infection in shrimp at highest electrical field strength (200 V m-1).

Despite the above research, the scientists list several topics in need of more investigation:

• _Indirect (or: delayed) mortality;

• _Non-mortal effects;

• _Effects on reproduction;

• _Long term effects on species that encounter pulse trawl gear and on their populations;

• _Minimum and maximum values for pulse characteristics (is there a ‘safe range’?);

• _Effects of pulse fishing on early life stadia of marine organisms that reproduce in shallow water;

• _Effects on seabed, substrate and water column: can the use of pulse result in dissolving toxic chemicals?

The number of pulse trawl licences in the Dutch fleet increased by a further 42 in 2014. This latest derogation was based on Article 14 of the basic CFP regulation (1380/2013): “In order to facilitate the introduction of the obligation to land all catches in the respective fishery in accordance with Article 15 ("the landing obligation"), Member States may conduct pilot projects, based on the best available scientific advice and taking into account the opinions of the relevant Advisory Councils, with the aim of fully exploring all practicable methods for the avoidance, minimisation and elimination of unwanted catches in a fishery.”

A 5-year pilot project is therefore being implemented that intends to address some of the remaining research gaps. In July 2015 an international symposium was organised by the Ministry of Economic Affairs in the Netherlands, which was attended by the assessment team. The state of knowledge, including many of the above studies, was presented to a range of stakeholders leading to a discussion of research priorities that would inform the eventual research plan for the pulse fishery.

The planned research agenda on pulse, developed by IMARES and ILVO, consists among others of three PhDs:

PhD1: using lab experiments to what extent electrical pulses on fish and benthos will lead to mechanical damage, physiological changes and changes of the natural behaviour. The questions about the (long term) impact of pulse on benthos, including the varying impacts under changing pulse settings, the impact on species that do not end up in the fishing net, on elasmobranches etc. will be covered by this research project.

PhD2, with lab- and field experiments examine what the (long term) effect of pulse is on ecosystem functioning, will contribute to a better understanding of the topics that these questions address.

PhD3 will apply and develop fleet dynamics- and ecosystem models that are necessary to calculate the effects of the transition to pulse on the scale of the North Sea. This research project will address questions about the displacement of the fishing fleet since the transition to pulse, and the impact on pulse on quota depletion.

As part of the research programme, the Dutch government proposed to establish a Scientific Advisory Board and organise an annual progress meeting like this to monitor the developments (MoEAa). This is an important element of the research plan to provide the independent validation of the results required. One aspect to consider is which effects can realistically be identified during a 5-year research programme and what can be inferred in relation to long-term effects.

3.5 Principle Three: Management System Background

Principle 3 of the Marine Stewardship Council standard states that:

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.

Jurisdiction

The North Sea sole and plaice fisheries operate in the North Sea across several European Union Member State jurisdictions (Netherlands, UK, Germany, Denmark, Belgium) that are all bound by the same rules and regulations as defined under the EU Common Fisheries Policy (CFP). Plaice fishing also extends into the Norwegian zone (part of ICES sub-area IVa) of the North Sea and as such represents a shared stock. However, the pulse fleet does not operate outside EU waters and the area of assessment is limited to ICES sub-area IVb & c.

There has been a bilateral agreement between the EU and Norway on fisheries matters since 1981 (EC Reg 2214/80), which is extended every six years with a 9-month termination period that has not been invoked to date. This includes annual agreement on relative shares of the North Sea plaice TAC. The sole fishery does not extend into the Norwegian zone.

Regulations

EU vessels are all bound by the same rules and regulations as defined under the EU Common Fisheries Policy (CFP) (EC reg. 1380/2013). These rules apply to vessels fishing outside EU waters, such as the Norwegian zone where compliance with Norwegian rules is also required.

The UoC vessels are UK-registered and so fish under UK licences with UK quota, are members of UK POs and report (via electronic logbooks) to UK authorities. They are also members of Dutch POs and are bound by the rules set by the Dutch POs, including the landing of fish through Dutch markets.

The UoC vessels are all twin-rig trawlers, but vessels from several member states using various gears also target the plaice fishery, including the newly developed pulse trawl, which has all but replaced the traditional beam trawl in the Dutch fleet.

All EU vessels are bound by the rules of the CFP, which are implemented in each Member State's waters. The objective of the CFP is to ensure that fisheries and aquaculture are ecologically, economically and socially sustainable. It is also concerned with maintaining employment and the sector's economic viability.

» The CFP was revised in order to make fisheries more sustainable and the new policy came into force in 2014. This includes commitments to:

- Fish stocks exploited at Maximum sustainable yield (MSY)
- Greater regionalization (through increased roles for Regional Advisory Councils, including the North Sea Advisory Council (North Sea AC)
- An ecosystem approach to fisheries by ensuring fishing capacity is in line with fishing opportunities and moving more stocks under Long Term Management Plans
- An obligation to land the fish that is caught (discard ban)

The landing obligation will be introduced in phases between 2015 and 2019. From 2016 in the plaice fishery, the discarding of plaice will not be permitted and from 2019 this will be extended to all quota species. In 2014, the Ministry of Economic Affairs awarded grants totaling €4.5 million in support of the Dutch fisheries sector. Supported projects include studies into preventing bycatch, such as placing cameras on fishing vessels or improving fishing nets. No subsidies are given that would increase the fishing capacity of individual vessels or the fleet overall.

The vessels are required to report the location and quantity of species retained on a daily basis via an electronic logbook that is transmitted to control authorities. Skippers must also notify authorities ahead of landing their fish and only into designated ports.

The CFP includes requirements for fishing vessels longer than 12 metres to report their logbook data, including catch data, electronically and to have an approved satellite-based vessel monitoring system (VMS) on board. Fishing vessels longer than 18 metres are also required to have an automatic

identification system (AIS) on board. From 1 May 2014, AIS must be on board all vessels over 15 metres in length.

Of critical importance to this assessment are the technical regulations (EC Reg. 850/98). Article 31 on Unconventional fishing methods states: 1. The catching of marine organisms using methods incorporating the use of explosives, poisonous or stupefying substances or electric current shall be prohibited.

Vessels require a fishing licence from the Dutch government based on an official derogation from the EC allowing the gear to be operated lawfully. This was granted in relation to 22 vessels in 2007, extended to a further 20 vessels in 2011 and increased by a further 42 in 2014. This latest derogation was based on Article 14 of the basic CFP regulation (1380/2013):

“In order to facilitate the introduction of the obligation to land all catches in the respective fishery in accordance with Article 15 ("the landing obligation"), Member States may conduct pilot projects, based on the best available scientific advice and taking into account the opinions of the relevant Advisory Councils, with the aim of fully exploring all practicable methods for the avoidance, minimisation and elimination of unwanted catches in a fishery.”

The pulse trawl derogation has therefore been extended to 84 vessels in total.

The MoEA has provided permission to use the pulse gear with the following conditions:

Based on section four and five of Article 53, of the Sea Fisheries Implementing Regulation (*Uitvoeringsregeling zeevisserij*), I hereby grant you authorisation to use your vessel (*name*) to fish for flatfish with an electrical beam trawl (hereinafter pulse trawl) provided you do so within six months of the date postmarked on this letter. This authorisation ends on (*February 2019*).

Permission requirements

The following provisions apply to this authorisation:

1. Fishing with pulse trawl is only allowed in the ICES divisions IVc and IVb south of a rhumb line joined by the following points, measured according to the WGS84 coordinate system:

• A point on the east coast of the United Kingdom at latitude 55° N, and

• A point on the west coast of Denmark at latitude 55° N.

2. Before fishing for flatfish the vessel must meet the following requirements:

a. maximum 1 kW per metre beam length or electric field width (electric capacity behind the ship’s generator and in front of the power cables);

b. The field strength is a maximum of 0.25 Vrms per centimetre of electrode distance;

c. The electrode distance is a maximum of 40 cm;

d. The width of the electric field measured as a horizontal distance between the two outer electrodes, the perpendicular length between electrodes may not exceed the width of the net, to a maximum of 12 metres per pulse fishing gear.

e. The vessel is equipped with an automatic computer management system which records the maximum power used per beam and the effective voltage between electrodes for at least the last 100 tows. It is not possible for non-authorised personnel to modify this automatic computer management system and

f. No tickler chains may be used in front of the footrope.

The requirements for the pulse trawl may be adjusted in the future.

3. A technical file (TF) must be kept on board during every fishing expedition. This TF must have been prepared by the supplier of the pulse fishing gear that was supplied to you and installed on your vessel, and this TF must contain a declaration from the supplier that the pulse fishing gear complies with the abovementioned requirements. The TF is part of the inspection of the pulse fishing gear. The Human Environment and Transport Inspectorate also requires a TF to be kept on board for fishing with a pulse trawl. The TF forms part of the regular certification of your vessel by the Human Environment and Transport Inspectorate.

4. You are required to cooperate with the study into the effects of pulse fisheries carried out in collaboration between the Ministry of Economic Affairs, the fisheries sector and research institutes. This cooperation may involve contributing towards the costs of the programme. Article 14 of the basic regulation provides for the possibility, within the framework of the landing obligation, to carry out a pilot project to fully study all the viable methods of preventing, reducing and eliminating unwanted catches in fisheries. This authorisation to allow fishing with electrical pulse fishing gear is part of this pilot project. In order to monitor the results of this pilot project your participation in the monitoring programme is required. You will receive further information about participation in this study.

5. If you undertake a fishing voyage exclusively within the Dutch EEZ, you should use the following fishing gear codes when using the pulse trawl.

Name of fishing gear	Code to be noted in logbook
Pulse trawl	PUK
Pulse wing	PUL

It should be noted that if the abovementioned requirements are not met, the authorisation may be revoked.

For the sake of completeness, I would like to point out that on the basis of section seven, Article 53, of the Sea Fisheries Implementing Regulation, the requirements attached to this authorisation can change.

This authorisation for the use of a pulse trawl is valid for a period of 5 years. The objective of the pilot project is to arrive at a generic authorisation of the pulse trawl. If the pilot project is successful, specific authorisation will no longer be necessary. However, should the results of the pilot project be insufficient, and not result in the generic authorisation of the pulse trawl, then the restriction on the use of the pulse trawl will continue to apply fully. Further exemptions to the restriction cannot and shall not be permitted.

Source MoEA, 2015c

Objectives

The objectives of the CFP are (EC reg. 1380/2013):

1. The CFP shall ensure fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies.

2. The CFP shall apply the precautionary approach to fisheries management, and shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield.

In order to reach the objective of progressively restoring and maintaining populations of fish stocks above biomass levels capable of producing maximum sustainable yield, the maximum sustainable yield exploitation rate shall be achieved by 2015 where possible and, on a progressive, incremental basis at the latest by 2020 for all stocks.

3. The CFP shall implement the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimised, and shall endeavour to ensure that aquaculture and fisheries activities avoid the degradation of the marine environment.

4. The CFP shall contribute to the collection of scientific data.

5. The CFP shall, in particular:

(a) gradually eliminate discards, on a case-by-case basis, taking into account the best available scientific advice, by avoiding and reducing, as far as possible, unwanted catches, and by gradually ensuring that catches are landed;

(b) where necessary, make the best use of unwanted catches, without creating a market for such of those catches that are below the minimum conservation reference size;

(c) provide conditions for economically viable and competitive fishing capture and processing industry and land-based fishing related activity;

(d) provide for measures to adjust the fishing capacity of the fleets to levels of fishing opportunities consistent with paragraph 2, with a view to having economically viable fleets without overexploiting marine biological resources;

(e) promote the development of sustainable Union aquaculture activities to contribute to food supplies and security and employment;

(f) contribute to a fair standard of living for those who depend on fishing activities, bearing in mind coastal fisheries and socio-economic aspects;

(g) contribute to an efficient and transparent internal market for fisheries and aquaculture products and contribute to ensuring a level–playing field for fisheries and aquaculture products marketed in the Union;

(h) take into account the interests of both consumers and producers;

(i) promote coastal fishing activities, taking into account socio- economic aspects;

(j) be coherent with the Union environmental legislation, in particular with the objective of achieving a good environmental status by 2020 as set out in Article 1(1) of Directive 2008/56/EC, as well as with other Union policies.

The plaice fishery and the wider management framework employ a range of tools to control inputs (vessel licences, effort limitations and gear restrictions) and outputs (Minimum Landing Size and quota.

Catch limits (quota) are applied in the plaice fishery and certain areas of the sea may also be closed to fishing, for example the real time closures (RTC) introduced as part of the cod recovery plan in the North Sea.

The plaice fishery is managed under a multi-annual management plan for plaice and sole in the North Sea (EC reg. 676/2007):

Article 3

Objectives of the multiannual plan in the first stage

1. The multiannual plan shall, in its first stage, ensure the return of the stocks of plaice and of sole to within safe biological limits.

2. The objective specified in paragraph 1 shall be attained by reducing the fishing mortality rate on plaice and sole by 10 % each year, with a maximum TAC variation of 15 % per year until safe biological limits are reached for both stocks.

Article 4

Objectives of the multiannual plan in the second stage

1. The multiannual plan shall, in its second stage, ensure the exploitation of the stocks of plaice and sole on the basis of maximum sustainable yield.

2. The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on plaice at a rate equal to or no lower than 0,3 on ages two to six years.

3. The objective specified in paragraph 1 shall be attained while maintaining the fishing mortality on sole at a rate equal to or no lower than 0,2 on ages two to six years.

Landings Obligation

The introduction of the landing obligation in the new Common Fisheries Policy (CFP)[14] represents a fundamental shift in the management approach to EU fisheries, switching the focus from the regulation of landings to catches as well as introducing regionalised decision-making into the management of EU fisheries. The Landings Obligation (EU) in demersal fisheries[15] will have to be phased in between 1st January 2016 – 2019, thus allowing a 3 year phasing in time for the sole and plaice fisheries in ICES IV. The inevitable implementation of the Landings Obligation has stimulated research in the improvement of gears, as well as survivability of bycatch (Batsleer, 2015). Although

[14] Regulation EU 1380/2013 on the Common Fisheries Policy

[15] http://ec.europa.eu/fisheries/cfp/fishingrules/landing-obligation/indexen.htm

one of the key drivers for using pulse trawl to fish for sole and plaice has been to reduce the weight of the fishing gear and thus reduce fuel consumption, the phasing in of the ban on discarding is also encouraging research into improved gears. **Error! Reference source not found.**

A fact-finding study to assess the impact of the landing obligation on demersal fisheries was conducted using 3 pulse trawlers, fishing in different areas. The study did not distinguish in great detail between the different species caught, it was primarily designed to assess the impact of retaining all bycatch on the cost to the fishery, such as labour cost for sorting the catch on board and ashore, and the potential revenue of landed discards. This was then drawn into a socio-economic context.

Roles and responsibilities

Several relevant organisations and bodies take an active role in the fishery under assessment and these are described below. Their roles are explicitly defined and well understood, and the interaction between them works effectively.

EU level

The CFP is revised every 10 years based on an extensive consultation and review process with inputs from all member states and representative bodies. The European Commission's Directorate General for Fisheries and Maritime Affairs (DG MARE) is the primary policy and management body for EU fisheries, overseeing implementation of the CFP in each EU Member State.

Fishing opportunities are set each year by the European Commission based on ICES advice following review by STECF and approval by the European Parliament and the Council of Ministers. In previous years' political influence could result in decisions on quota deviating from the scientific advice. The additional scrutiny and commitment to fishing at MSY means that this is no longer the case and, when the ICES advice is reviewed (by STECF) the fishing opportunities follow this. In the case of North Sea plaice, operating under a long term management plan with sole, greater certainty is possible as quota can only increase or decrease by 15% from one year to the next. North Sea Advisory Council (NSAC) provides North Sea management advice to the European Commission. This is a multi-stakeholder organisation established in 2004 with 25 members[16] covering commercial fishing representatives, environmental NGOs and recreational fisher representatives. The principle objective of the NSAC is to "prepare and provide advice on the management of the fisheries of the North Sea on behalf of stakeholders in order to promote the objectives of the Common Fisheries Policy. This will be done within the general aim of attaining the sustainable management of fisheries, incorporating an ecosystem based approach and based of the precautionary principle." Each year the NSAC agrees a workplan with its members, which is approved by the European Commission. The workplan identifies specific areas of work that will be addressed and sets out the meeting schedule for the year.

While the NSAC remains advisory, its contribution to policy and management decisions at an EU level has grown in importance.

National level

In the Netherlands fisheries are under the responsibility of the Ministry of Economic Affairs (MoEA). The Directorate General for Agri and Nature under the MoEA develops Dutch fisheries policy based on the CFP as well as environmental policy, illustrating the close linkage between policy considerations under the MSC Principles 1 and 2. The objectives of Dutch fisheries policies are outlined in the recent document describing its approach to spending under the new European Maritime and Fisheries Fund (EMFF) (MoEA, 2015c).

A co-management approach is adopted in the Netherlands with the MoEA and the industry active in developing and implementing policy.

With regard to the pulse fishery specifically, the MoEA has produced a pilot project on pulse fishing and the landing obligation as the basis for seeking the additional 42 licences. Based on the experience of recent years with the innovative and selective pulse technique, the Netherlands is working on a programme for which 42 extra pulse fishing licences have been issued. These will be linked to extensive monitoring and research activities. The programme has two objectives:

[16] See membership list at: http://www.nsrac.org/category/about-nsrac/members-list/

1. To examine on wide scale how the pulse fishing method, whether or not combined with certain arrangements and adaptations of the net design, can contribute to greater selectivity on the part of the Dutch flatfish fleet and so reduce the impact of the landing obligation to an acceptable level.

2. To gather missing/supplementary data and knowledge, with a view to full approval of pulse fishing in the North Sea.

The MoEA confirms that control and inspection of the use of the pulse fishing gear will occur on the basis of a technical file, physical controls and data transfer from the black box (MoEA, 2014). Consultations during the site visit confirmed this aspect of the pulse fishery was still being finalized.

Industry Representation

There are several tiers of industry representation, which form a crucial role in providing the industry with an effective voice in both management and science. They also play an important role in lobbying. Not least among these various representative bodies is the Cooperative Visserij Organisatie (CVO), representing the seven Dutch Fish Producer Organisations. The CVO is the client for other MSC certificates for North Sea sole and plaice fisheries.

The vessels in the UoC are members of both UK and Dutch Fish Producer Organisations. The management of UK quota involves the UK POs, while the landing of fish into the Netherlands involves the Dutch POs (e.g. Urk P.O,). The vessels are therefore informed by and can engage with management authority consultations via either or both PO representatives.

Scientific Advice

The core backdrop to the management of this fishery is the advice provided by the ICES Advisory Committee (ACOM), which draws on the on-going work of international scientists from relevant research laboratories and institutions on the stock biology and marine science. The main working group responsible for providing advice on plaice fisheries is the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), which also regularly reviews stock assessment and data gathering methodologies.

There is an excellent level of relevant scientific capacity in the Netherlands. In terms of fisheries the statutory national scientific role is provided by IMARES (Institute for Marine Resources and Ecosystem Studies), part of the Wageningen University & Research Centre. The purpose of IMARES is to " provide the scientific support that is essential for developing policies and innovation in respect of the marine environment, fishery activities, aquaculture and the maritime sector." IMARES therefore plays an important role in commercial fisheries through research and advice on fish and shellfish population biology, stock status, dynamics and wider ecosystem aspects.

Compliance and enforcement.

There is a high degree of enforcement and control in the plaice fishery. Inspections occur at sea by the respective Member State control agencies, through the scrutiny of elogbooks and on landing, throughout the sales and supply chain to ensure that all fish handled is legally caught.

Vessels provide elogbook data directly to UK control authorities, the Marine Management Organisation for English vessels and Marine Scotland Compliance in Scottish vessels. This data is then shared with the Dutch authorities (NVWA). These control agencies, along with Danish and German control agencies, have developed a high level of co-operation and conduct joint operations in North Sea waters.

The Dutch Food and Consumer Product Safety Authority (NVWA) is the primary control agency; it monitors the entire fisheries chain, from catching or farming to the restaurant. It is also the body responsible for vessel, port and market inspections.

The plaice fishery extends into the Norwgian zone (not involiving UoC vessels) and this area is recognized as having an effective and rigorous MCS regime.

Overall there is a high degree of confidence in the enforcement system and no evidence of systematic non-compliance.

Code of Conduct

In addition to the formal management system described above, the client has implemented a Code of Conduct for member vessels (CVO, 2015a).

The CVO Code of Conduct is signed by pulse fishermen individually. A total of 80 fishermen (active for flatfish) signed the Code of conduct; fishermen that use the pulse trawl only for shrimps, or companies that are not active yet did not sign the code of conduct. If one of these vessels becomes an active pulse vessel fishing for flatfish, they will be asked to sign the Code of Conduct.

By signing the Code of Conduct, the fishermen declare that:

- he/she has taken note of the content of this code of conduct and the corresponding 'Penalty regulation MSC pulse fishery', that he/she agrees to the provisions they contain, and that
- he/she will comply with the requirements laid down in the code of conduct and the penalty regulations.
- in case a penalty is imposed on him/her for violating one of the requirements in this code of conduct, he/she will pay this to the CVO at once (also in case an appeal is lodged).

The Code of Conduct contains requirements on the following subjects:

- Control and Enforcement (article 2)
- Habitat Management (article 3)
- Participation in research (article 4)
- Registration of fishing activities (article 5)
- Collection and publication of data about catches of 'ETP species' (article 6)
- Measures for increasing the survival of sharks and rays (article 7)
- Cooperation on the MSC action plan once the MSC certificate for the pulse fishery has been obtained (article 8)
- The landing of fish under the MSC certificate once the MSC certificate for the pulse fishery has been obtained (article 8)
- The compliance on regular fishery related legislation (article 8)

CVO Management Strategy

The CVO has developed a management strategy for the pulse fishery (CVO, 2015b). It contains the following strategies focusing on MSC performance indicators:

1. By-catch management strategy:

a. The pulse gear has a scientifically proven higher selectivity for sole than the traditional beam trawl gear. Catches of plaice (landings and discards) and benthos are considerably lower.

b. The CVO pulse fishery is committed to further decrease discards and will continue to engage in projects aimed for discards reduction.

c. The CVO will collaborate with scientific institutes to continue to provide representative data on the catch composition and discards in the pulse fishery.

2. ETP management strategy:

a. According to MSC methodology, ETP species are defined as those that are recognised as such by national legislation and/or binding international agreement (e.g. CITES) to which the jurisdictions controlling the fishery under assessment are party. The CVO will keep a list of relevant ETP species up-to-date on the website www.cvo-visserij.nl

b. The CVO aims for a robust and meaningful record of catches of ETP species by running an ETP monitoring program in the following stages:

i) 25% of the CVO pulse trawl flatfish fleet to record ETP catches on every fishing trip during the whole trip, starting from the 1st of May of 2015 onwards. Species that are taken into account: ETP recognized by MSC and additional species of interest.

ii) 50% of the CVO pulse trawl flatfish fleet to record ETP catches on every fishing trip during the whole trip, starting from the 1st of May of 2016 onwards. Species that are taken into account: ETP recognized by MSC and additional species of interest.

c. The CVO will verify the data from the ETP-registration with independently collected scientific data on the interaction of the pulse trawl in relation to ETP species.

d. The CVO will collect the data from the participants in the program named under b) on a monthly

basis and will publish the data every year on www.cvo-visserij.nl
e. The CVO will actively inform the CVO pulse fleet on measures to increase survival of ETP species and where possible facilitate implementation of these measures for all fishermen within the CVO scheme, by means of for instance training and/or supplying materials.

3. Retained species strategy:
a. The CVO will publish detailed landings data of the CVO pulse fishery on a yearly basis on the website www.cvo-visserij.nl
b. The CVO will continue to engage in projects aimed at better selectivity of retained species.

4. Habitat management strategy:
a. The CVO will continue to liaise with relevant authorities to allow for a separate gear code that reflects the use of the pulse trawl in the electronic logbooks (EU logbooks).
b. Until it is possible to separately register the use of the pulse trawl in the electronic logbook (see 4a), CVO will facilitate this registration and the collection of equivalent data itself.
c. The CVO will publish yearly anonymised data on the fishery spread of the pulse fishery on www.cvo-visserij.nl
d. The CVO will review the data published as a result of 4c on a yearly basis, and link this to the most recent scientific evidence on habitat impact of the pulse trawl gear. If the current fishing activity of the pulse trawl fleet reveals a risk to certain special areas of interest (such as VME's) the CVO will take additional habitat management measures to limit the impact.

5. Strategy on control and enforcement of the pulse characteristics:
a. The CVO will continue to liaise with relevant authorities to encourage the speedy implementation of the official control and enforcement of the pulse characteristics on pulse vessels.
b. Until the official control and enforcement process on the pulse characteristics (named in 5a) has successfully been implemented, the CVO will appoint an external inspector to inspect the compliance of CVO pulse fishermen on the official pulse specifications, as set out in the Code of Conduct for the CVO pulse fishery. Once the official control and enforcement process has successfully been implemented, CVO will no longer appoint external inspectors for this purpose.
c. The inspectors will use a standardized inspection protocol, which will be published on the website www.cvo-visserij.nl
d. The CVO will keep, and review, a record of completed inspections
e. Violation of the rules regarding the pulse characteristics will be sanctioned according to the 'Penalty regulation MSC pulse fishery'.

6. Strategy on control and enforcement in general
a. All CVO pulse fishermen are obliged to sign and comply with the rules as set out in the 'Code of Conduct CVO pulse fishery for flatfish'
b. Violations of the rules as set out in the 'Code of Conduct CVO pulse fishery for flatfish', with specific reference to article 2 and 8, will be sanctioned according to the 'Penalty regulation MSC pulse fishery'
c. Violations of all relevant national and international regulations will be handled by the Management Authority. In the case of severe violations of relevant (inter-)national regulations which could potentially harm the sustainable characteristics of the CVO pulse fishery, these will also be sanctioned according to the 'Penalty regulation MSC pulse fishery'.

As the official process regarding control and enforcement is yet to be fully implemented, the CVO has appointed an external inspector to carry out inspections to verify compliance with the requirements in the pulse derogation.

At the time of the site visit the inspector had carried out around 40 vessel inspections according to a control protocol drawn up by the CVO and provided a report of the findings to the board. No requirement for the aforementioned sanctions was identified.

The CVO Code of Conduct and its management strategy show a clear intent to comply with MSC requirements and address shortcomings in the knowledge-base and in the current management of the fishery.

4. Evaluation Procedure

4.1 Harmonised Fishery Assessment

At the time of writing, six MSC assessments had already been completed that overlap with this assessment (detailed below) and findings presented in published assessment reports. In addition, 3 MSC re-assessments overlapping this fishery are currently underway (also detailed below).

These formed an important background resource for the assessment team - collating and reporting on available stock and fishery information, as well as highlighting areas of stakeholder and assessment team concerns.

Completed assessments

» CVO North Sea plaice and sole fishery

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/cooperative-fishery-organisation-cvo-north-sea-plaice-and-sole

» DFPO Denmark North Sea sole

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/dfpodenmarknorthseasole/fishery-name/?searchterm=sole

» FROM Nord North Sea and eastern channel trammel net sole

https://www.msc.org/track-a-fishery/fisheries-in-the-program/in-assessment/north-east-atlantic/from-nord-north-sea-and-eastern-channel-trammel-net-sole/from-nord-north-sea-and-eastern-channel-trammel-net-sole/?searchterm=sole

» DFPO Denmark North Sea plaice

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/Denmark-North-Sea-plaice

» Ekofish Group North Sea twin-rigged plaice

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/Ekofish-Group-North-Sea-twin-rigged-otter-trawl-plaice

» Osprey Trawlers North Sea twin-rigged plaice

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/Osprey-Trawlers-North-Sea-twin-rigged-plaice

Assessments in progress

The DFPO, Osprey and Ekofish plaice fisheries are in the process of being re-assessed.

The above fisheries target the same stocks, but none use the pulse trawl gear, resulting in differences to scoring under Principle 2 and Principle 3.

4.1.1 Harmonisation Details

Harmonisation meeting

Harmonisation with a number of North Sea flatfish fisheries was undertaken with a harmonisation meeting (conference call) held involving P1 experts and team leaders in relation to plaice in July 2015.

Meeting Outcomes

As a result of harmonisation meetings, two conditions for the plaice UoC were agreed. These are detailed in Appendix 1.3.

4.2 Previous assessments

The North Sea plaice and sole fishery has been certified for vessels using various trawl methods (not beam trawl) operated by CVO member vessels:

» **CVO North Sea plaice and sole fishery**

https://www.msc.org/track-a-fishery/fisheries-in-the-program/certified/north-east-atlantic/cooperative-fishery-organisation-cvo-north-sea-plaice-and-sole

Assessment conclusion: certified as sustainable in December 2012

Compliance with conditions: surveillance to date has shown compliance with the conditions set.

4.3 Assessment Methodologies

This fishery was assessed using version 1.3 of the MSC Certification Requirements and version 1.3 of the MSC Full Assessment Reporting Template.

4.3.1 Assessment Tree

The Default Assessment tree was used with no adjustments.

4.4 Evaluation Processes and Techniques

4.4.1 Site Visits

During week commencing 28th June 2015, all 3 members of the assessment team undertook a site visit to Ijmuiden and Scheveningen. This enabled a scheduled programme of consultations to take place with key stakeholders in the fishery – including skippers, scientists, fishery protection officers, NGOs, fishery managers and technical support staff. Prior notification of this site visit was issued on the MSC website and in Fishing News in order that all relevant stakeholders were aware of the opportunity to meet with the assessment team.

Itinerary of field activities

Table 1 Itinerary of site visit and interviews held

Day	Date	Activity	Location	Organisation	Name
Sunday	28/06/15	Arrive	Amsterdam		
		Vessel Visit	Scheveningen		
Monday	29/06/15	Stakeholder meetings	Ijmuiden	Delmeco	Ko Zwemer Erwin Luitwieler
			""	HFK	Harmen Klein Woolthuis
		Client meeting	""	CVO	Inger Willms
Tuesday	30/06/15	Stakeholder meetings	""	Control Union	Jan Martien Zuidema

Day	Date	Activity	Location	Organisation	Name
			""	Ministry/Control	Mr Hans Vervoort & Richard van Buuren
			""	Ministry of Economics	Kees Verbogt
			""	Elasmobranch	Irene Kingma
			""	North Sea Foundation	Chrsitien Absil
			""	WWF - Netherlands	Monique van de Water
Wednesday	01/07/15	Stakeholder meetings	""	LEI	Mike Turenhout
			""	ILVO	Bart Verschueren (pulse fishing technology), Marieke Desender (effects of pulse fishing), Kim Sys (sustainability assessment of fisheries)
			IMARES, IJmuiden.	IMARES	Adriaan Rijnsdorp
			""	IMARES	Bob van Marlen
Thursday	02/07/15	Scheveningen Symposium	Scheveningen	International Pulse Fishing Symposium	Multiple stakeholders
Friday	03/07/15	Market visit	Den Helder	CVO	Pim Visser, Inger Wilms
		Client closing meeting		CVO	
		Preliminary scoring	Amsterdam	Assessment team	
		Leave	Amsterdam		

Source: Acoura assessment team

Additional individuals contacted during field activities

In addition to the stakeholders met during the site visit, written submissions were received from two UK environmental NGOs: Marine Conservation Society and the Royal Society for the Protection of Birds (RSPB). These are presented in Appendix 3.

4.4.2 Consultations

Stakeholder issues

Written and verbal representations were provided to the assessment team expressing a range of views, opinions and concerns. The team is of the view that matters raised have been adequately debated and addressed as a part of the scoring process for this fishery, and that none of the issues raised, therefore, require separate attention beyond that represented in this report.

Interview Programme

Following the collation of general information on the fishery, a number of meetings with key stakeholders were scheduled by the team to fill in information gaps and to explore and discuss areas of concern.

Meetings were held as per Table 1 above.

Summary of Information Obtained

Interviews with research agencies highlighted the ongoing work to determine the type and extent of impacts to marine organisms, as well as the difficulties of researching in-situ and unexpected effects.

Interviews with the skippers of pulse trawl vessels provided a good understanding of the operation and performance of the pulse trawl gear.

Interviews with the Environmental NGOs highlighted their concerns over the unknown and longer-term impacts of this novel gear.

Presentations and discussions at the International Symposium on pulse trawling showed the large body of ongoing and planned research work on the impacts of the gear. Stakeholders expressed concerns over its widespread adoption on a 'pilot' basis.

4.4.3 Evaluation Techniques

Public Consultation

A total of 21 stakeholder individuals and organisations having relevant interest in the assessment were identified and consulted during this assessment. The interest of others not appearing on this list was solicited through the postings on the MSC website, and by advertising in 'Visserijnieuws' (27-03-2015). These were felt to be the most appropriate media for making these public announcements as 'Visserijnieuws' has significant readership / uptake in the primary stakeholder locations for this fishery and the processes used on the MSC website for tracking and announcing the various stages of the assessment as it progresses - from Full Announcement through to Certification - form an ideal tool through which to channel stakeholder interest and keep them abreast of the important stages of the assessment as a whole.

Initial approaches were made by email and followed up by phone. Issues raised during correspondence were investigated during research and information gathering activities, and during interviews.

Most stakeholders contacted during this exercise either indicated that they had no direct interest in this fishery assessment, or that they had no particular cause for concern with regard to its assessment to the MSC standard.

Process

The MSC is dedicated to promoting "well-managed" and "sustainable" fisheries, and the MSC initiative focuses on identifying such fisheries through means of independent third-party assessments and certification. Once certified, fisheries are awarded the opportunity to utilise an MSC promoted eco-label to gain economic advantages in the marketplace. Through certification and eco-labelling the MSC works to promote and encourage better management of world fisheries, many of which have been suggested to suffer from poor management.

The MSC Principles and Criteria for Sustainable Fisheries form the standard against which the fishery is assessed and are organised in terms of three principles:

» **MSC Principle 1** - Resource Sustainability

» **MSC Principle 2** - Ecosystem Sustainability

» **MSC Principle 3** - Management Systems

A fuller description of the MSC Principles and Criteria and a graphical representation of the assessment tree is presented as **Appendix 1a** to this report.

The MSC Principles and Criteria provide the overall requirements necessary for certification of a sustainably managed fishery. To facilitate assessment of any given fishery against this standard, these Criteria are further split into Sub-criteria. Sub-criteria represent separate areas of important information (e.g. Sub-criterion 1.1.1. requires a sufficient level of information on the target species and stock, 1.1.2 requires information on the effects of the fishery on the stock and so on). These Sub-criteria, therefore, provide a detailed checklist of factors necessary to meet the MSC Criteria in the same way as the Criteria provide the factors necessary to meet each Principle.

Below each Sub-criterion, individual 'Performance Indicators' (PIs) are identified. It is at this level that the performance of the fishery is measured. Altogether, assessment of this fishery against the MSC standard is achieved through measurement of 31 Performance Indicators. The Principles and their supporting Criteria, Sub-criteria and Performance Indicators that have been used by the assessment team to assess this fishery are incorporated into the scoring sheets (**Appendix 1.1**).

Scoring of the attributes of this fishery against the MSC Principles and Criteria involves the following process:

» Decision to use the MSC Default Assessment Tree contained within the MSC Certification Requirements (Annex CB)

» Description of the justification as to why a particular score has been given to each sub-criterion

» Allocation of a score (out of 100) to each Performance Indicator

In order to make the assessment process as clear and transparent as possible, the Scoring Guideposts are presented in the scoring table and describe the level of performance necessary to achieve **100** (represents the level of performance for a Performance Indicator that would be expected in a theoretically 'perfect' fishery), **80** (defines the unconditional pass mark for a Performance Indicator for that type of fishery), and **60** (defines the minimum, conditional pass mark for each Performance Indicator for that type of fishery). The Assessment Tree and Scoring Guideposts for the CVO pulse sole and plaice fishery are shown as **Appendix 1.1** to this report.

Scoring outcomes

There are two, coupled, scoring requirements that constitute the Marine Stewardship Council's minimum threshold for a sustainable fishery:

» The fishery must obtain a score of 80 or more for each of the MSC's three Principles, based on the weighted average score for all Criteria and Sub-criteria under each Principle.

» The fishery must obtain a score of 60 or more for each Performance Indicator.

A score below 80 at the Principle level or 60 for any individual Performance Indicator would represent a level of performance that causes the fishery to automatically fail the assessment. A score of 80 or above for all three Principles results in a pass.

5. Traceability

5.1 Eligibility Date

The **Target Eligibility Date** for this fishery will be the certification date. This means that any fish caught by the certified fleet following that date will be eligible to enter the chain of custody as certified product if and when certification is ultimately granted. The rationale for this date is that it meets with the client's wishes, for commercial reasons, for the date to be set at the earliest point at which the Certification Requirements allow.

The measures taken by the client to account for risks within the traceability of the fishery – and therefore generating confidence in the use of this date for target eligibility – are detailed in the rest of this section.

5.2 Traceability within the Fishery

Traceability up to the point of first landing has been scrutinised as part of this assessment and the positive results reflect that the systems in place are deemed adequate to ensure fish is caught in a legal manner and is accurately recorded. The report and assessment trees describe these systems in more detail, but briefly traceability can be verified by:

- The skippers of the vessels are responsible for ensuring the provenance of the certified plaice & sole to point of sale. They must complete logbooks detailing the date, gear, volume and location (by ICES rectangle) of all catch retained onboard on a daily basis.
- Catches are boxed with each box weighed and labeled with information on species, vessel, date and fishing location.
- Information on catches is cross-checked with quota holdings for the vessel and with sales notes at point of sale (generally a Dutch auction market).
- Information submitted on fishing activity is cross-checked with satellite tracking using a vessel monitoring system (VMS). VMS also enables real-time tracking of activity.
- In line with Council regulation 1005/2008 on illegal, unreported and unregulated (IUU) fishing, no transhipment is permitted outside a designated Member State port. All catch must be retained onboard prior to landing to a designated port.

Dutch fishery officials (NVWA), other Member State control agencies and the Dutch POs report no compliance issues specific to these vessels and a high level of compliance in this fleet overall. Therefore, the risk that catch is misreported is deemed to be low.

5.2.1 Description of Tracking, Tracing and Segregation Systems within the Fishery and Management systems in place relating to Traceability

All UoC vessels are required to be operated with vessel monitoring systems (VMS), which is administered by the relevant control authorities.

All vessels must provide daily logbooks, now submitted electronically on a daily basis to control authorities. The logbooks state the vessel and gear details (currently still under a general beam trawl code, TBB), fishing locations and retained catches in relation to ICES sub-areas.

All landings by Dutch PO member vessels (i.e. all UoC vessels) must go through a Dutch market. These have electronic sales systems that record detail of the first hand sale of all boxes of fish entering the market. Sales notes are provided to the management authorities.

5.2.2 Evaluation of Risk of Vessels Fishing Outside of UoC

All vessels are above 12m in length and therefore are required to operate with VMS enabling control authorities to identify where a vessel is fishing at any given time. This confirms the vessels operate

within the North Sea sub-areas of IVa and IVb only. Fishers must report catches in logbooks in terms of these ICES sub-areas.

Changing fishing gear from pulse to traditional beam trawling or other gear during a trip is highly unlikely given the different set-up and complexities of the gear.

5.2.3 Risk of Substitution of Mixing Certified / Non-Certified Catch prior to point of landing

All vessels operating under the UoC complete electronic log books detailing each day's fishing activity. Currently, the use of the pulse trawl is registered as TBB in the electronic logbook, since there is no separate official gear code available yet. However, the CVO is able to detail the fishing activity of the pulse fishery very accurately, since (1) the use of the pulse trawl is restricted to the fishermen that have a derogation, (2) switching between gears is a considerable operation and (3) the only switch between gears that is not visible in the logbook (pulse trawl to traditional beam trawl and back) is one that does not happen very often.

As the specific vessels holding pulse licences are known, their landings can be distinguished from non-certified catch (e.g. from traditional beam trawl fleet and other fleets).

5.2.4 At-Sea Processing

No at sea processing is conducted in the fishery, other than gutting the fish.

5.2.5 Trans-Shipment

No transhipment occurs in the fishery.

5.2.6 Robustness of management systems relating to traceability

The management systems are well-established and robust, enabling traceability at first hand sale and onwards of the specific vessels and details of the fishing trip. This enables all sole and plaice landings by the UoC vessels to be clearly distinguished.

5.3 Eligibility to Enter Further Chains of Custody

Only North Sea sole and plaice caught in the manner defined in the Unit of Certification (**Section 3.1**) under restrictions detailed throughout the body of the final Public Certification Report for this fishery shall be eligible to enter the Chain of Custody. Chain of Custody should commence following the first point of landing, at which point the product shall be eligible to carry the MSC logo (under restrictions imposed by the MSC Chain of Custody standard). There are no restrictions on the fully certified product entering further chains of custody. The CVO does not require its own chain of custody certificate.

5.3.1 Eligible points of landing

Eligible points of landing are all designated ports around the North Sea coast.

5.3.2 Parties eligible to use the fishery certificate

The CVO has published and maintains a current vessel list. Conditions for certificate sharing are also detailed on the website.

6. Evaluation Results

6.1 Principle Level Scores

Table 2 Final principle scores

Principle	Uoc 1 - Plaice	Uoc 2 - Sole
Principle 1 – Target Species	84.4	85.0
Principle 2 - Ecosystem	76.7	76.7
Principle 3 – Management System	87.0	87.0

Source: Acoura assessment team

6.2 Summary of Scores

Table 3 Summary of Performance Indicator Scores

Component	Wt (L2)	PI No.	Performance Indicator (PI)	Plaice	Sole
Outcome	0.5	1.1.1	Stock status	90	90
		1.1.2	Reference points	75	80
		1.1.3	Stock rebuilding		
Management	0.5	1.2.1	Harvest strategy	90	85
		1.2.2	Harvest control rules & tools	75	75
		1.2.3	Information & monitoring	90	90
		1.2.4	Assessment of stock status	90	90
Retained species	0.2	2.1.1	Outcome	85	85
		2.1.2	Management	85	85
		2.1.3	Information	80	80
Bycatch species	0.2	2.2.1	Outcome	85	85
		2.2.2	Management	80	80
		2.2.3	Information	80	80
ETP species	0.2	2.3.1	Outcome	65	65
		2.3.2	Management	85	85
		2.3.3	Information	65	65
Habitats	0.2	2.4.1	Outcome	70	70
		2.4.2	Management	75	75
		2.4.3	Information	75	75
Ecosystem	0.2	2.5.1	Outcome	70	70
		2.5.2	Management	75	75
		2.5.3	Information	75	75
Governance and policy	0.5	3.1.1	Legal & customary framework	95	95
		3.1.2	Consultation, roles & responsibilities	95	95
		3.1.3	Long term objectives	100	100
		3.1.4	Incentives for sustainable fishing	90	90
Fishery specific management system	0.5	3.2.1	Fishery specific objectives	90	90
		3.2.2	Decision making processes	75	75
		3.2.3	Compliance & enforcement	70	70
		3.2.4	Research plan	80	80
		3.2.5	Management performance evaluation	80	80

Source: Acoura assessment team

6.3 Summary of Conditions

Table 4 Summary of conditions

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/ N/A)
1	Ensure the reference points are consistent with MSY	1.1.2 Reference Points	n/a
2	Ensure harvest control rules are consistent with MSY	1.2.2 Harvest Control Rules and Tools	n/a
3	Establish the impacts of the fishery on all ETP species are within acceptable levels.	2.3.1 ETP species outcome	n/a
4	Information on ETP impacts by the fishery is adequate to support the management strategy	2.3.3 ETP species information	n/a
5	Establish the impacts of the fishery on all habitats species are within acceptable levels.	2.4.1 Habitats outcome	n/a
6	Habitat management takes into account the impacts of the pulse fishery	2.4.2 Habitats management	n/a
7	Information on habitat impacts by the fishery is adequate to support the management strategy	2.4.3 Habitats information	n/a
8	Establish the impacts of the fishery on ecosystem components are within acceptable levels.	2.5.1 Ecosystem outcome	n/a
9	Ecosystem management takes into account the impacts of the pulse fishery	2.5.2 Ecosystem management	n/a
10	Information on ecosystem impacts by the fishery is adequate to support the management strategy	2.5.3 Ecosystem information	n/a
11	Decision-making processes are timely and precautionary	3.2.2 Decision-making processes	n/a
12	Control and enforcement is demonstrably effective and sanctions provide an effective deterrent.	3.2.3 Control and Enforcement	n/a

Source: Acoura assessment team

6.3.1 Recommendations

There are no recommendations for this fishery.

6.4 Determination, Formal Conclusion and Agreement

The fishery did not score less than 60 against any MSC Criteria, but has not attained a score of 80 or more against each of the MSC Principles.

It is therefore determined that the **CVO pulse sole and plaice fishery should not be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries**.

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Appendix 1. Scoring & Rationale

Appendix 1a – MSC Principles & Criteria

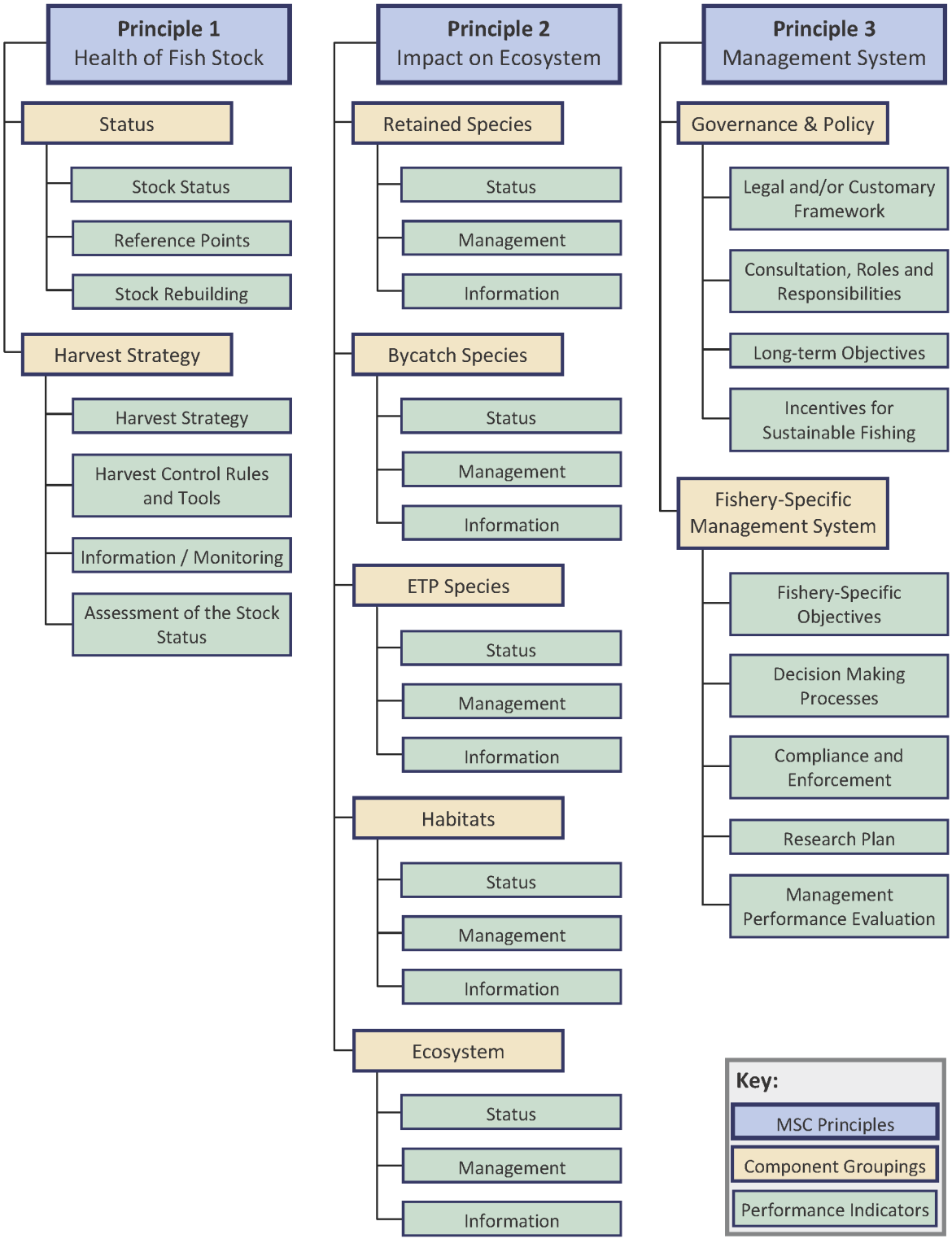


Figure A1 – Graphic of MSC Principles and Criteria

Below is a much-simplified summary of the MSC Principles and Criteria, to be used for over-view purposes only. For a fuller description, including scoring guideposts under each Performance Indicator, reference should be made to the full assessment tree, complete with scores and justification, contained in **Appendix 1.1** of this report. Alternately a fuller description of the MSC Principles and Criteria can be obtained from the MSC website (www.msc.org).

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.

Intent:

The intent of this Principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short-term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Status

» The stock is at a level that maintains high productivity and has a low probability of recruitment overfishing.

» Limit and target reference points are appropriate for the stock (or some measure or surrogate with similar intent or outcome).

» Where the stock is depleted, there is evidence of stock rebuilding and rebuilding strategies are in place with reasonable expectation that they will succeed.

Harvest strategy / management

» There is a robust and precautionary harvest strategy in place, which is responsive to the state of the stock and is designed to achieve stock management objectives.

» There are well defined and effective harvest control rules in place that endeavour to maintain stocks at target levels.

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

» The stock assessment is appropriate for the stock and for the harvest control rule, takes into account uncertainty, and is evaluating stock status relative to reference points.

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

Intent:

The intent of this Principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Retained species / Bycatch / ETP species

» Main species are highly likely to be within biologically based limits or if outside the limits there is a full strategy of demonstrably effective management measures.

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

» Information is sufficient to quantitatively estimate outcome status and support a full strategy to manage main retained / bycatch and ETP species.

Habitat & Ecosystem

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

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

» The nature, distribution and vulnerability of all main habitat types and ecosystem functions in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery and there is reliable information on the spatial extent, timing and location of use of the fishing gear.

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.

Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

Governance and policy

» The management system exists within an appropriate and effective legal and/or customary framework that is capable of delivering sustainable fisheries and observes the legal & customary rights of people and incorporates an appropriate dispute resolution framework.

» Functions, roles and responsibilities of organisations and individuals involved in the management process are explicitly defined and well understood. The management system includes consultation processes.

» The management policy has clear long-term objectives, incorporates the precautionary approach and does not operate with subsidies that contribute to unsustainable fishing.

Fishery specific management system

» Short and long term objectives are explicit within the fishery's management system.

» Decision-making processes respond to relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner.

» A monitoring, control and surveillance system has been implemented. Sanctions to deal with non-compliance exist and there is no evidence of systematic non- compliance.

» A research plan provides the management system with reliable and timely information and results are disseminated to all interested parties in a timely fashion.

Appendix 1.1 Performance Indicator Scores and Rationale

Evaluation Table for PI 1.1.1 (Plaice)

PI 1.1.1		**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	Y	Y	Y
	Justification	The stock is well above the reference point below which risk of recruitment failure may occur (B_{lim}). Based on the ICES advice (ICES, 2015a), the SSB is expected to be around 957,000t in 2016 which is 6 times the level of B_{lim} (160,000t). The SSB is also well above B_{pa} (230,000t) which is the biomass level set to ensure a low probability of the biomass falling to B_{lim}. The current level of fishing mortality (F_{2014} = 0.18) is also well below F_{lim} (0.6), the level at which continued fishing would be likely to lead to recruitment failure. The stock is at an historically high level and there is a high degree of certainty that the stock is above the point where recruitment would be impaired and this satisfies the first SG at 100.		
b	**Guide post**		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		Y	N
	Justification	Under the Multiannual Management Plan (MAMP), the target reference point in stage two of the plan has been defined as no lower than F=0.3. This was determined on the basis that F=0.3 would ensure exploitation of the plaice stock at MSY. The current values for F_{catch} have been below F=0.3 since 2008 and consequently, the stock can be considered to be at or fluctuating around its target reference point. The issue of whether the target reference point is consistent with MSY is considered under 1.1.2. SG100 is not met because SSB in 2014 ranged between 655 kt and 902 kt, thus there is not an high degree of certainty (Pr>95%) that the stock has been fluctuating around its target reference point.		
References		EU. 2007. COUNCIL REGULATION (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Official Journal of the European Union L 157/1. WKMSYREF-3. 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp. ICES. 2015a. Book 6, section 6.3.31, Plaice (*Pleuonectes platessa*) in Subarea IV (North Sea and Division III (Skagerrak),13 pp ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13.		
Stock Status relative to Reference Points				

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Target reference point	F_{MP}	0.3	F0.18/F0.3 = 0.6 957,000 in 2016
Limit reference point	B_{lim}	160,000t SSB	957,000/160,000 = 5.98
OVERALL PERFORMANCE INDICATOR SCORE: All SGs met at 80 and one of two met at SG 100			**90**
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.2

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
a	Guide post	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	Y	Y	
	Justification	ICES is committed to working within a precautionary framework and since 2010 has also provided advice that is consistent with MSY. For plaice, limit and precautionary reference points have been set for both biomass and fishing mortality. All reference points have a firm technical basis and have been set taking uncertainty into account. The current reference points were established in 2004 when discard estimates were included in the assessment for the first time. The reference points are based on the North Sea stock only and do not include the addition of plaice from the Skagerrak which add around 10% more to the stock size. This is not expected to change the appropriateness of the reference points and satisfies the first SI at 80.		
b	Guide post		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		Y	N
	Justification	The biomass limit reference point is set at B_{lim}. As there was no evidence of a breakpoint in the stock-recruit relationship, B_{lim} has been set at the lowest observed SSB at which recruitment does not appear to have been reduced. This is an acceptable precautionary approach also confirmed by simulation.. The associated limited reference point for fishing mortality is F_{lim} which is the fishing mortality likely to result in the SSB falling below B_{lim} in the long term. This satisfies the second guideline at SG80.SG 100 is not meet because at the time of the assessment the impact of adding Skagerrak to the stock had not been examined.		
C	Guide post		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		N	(Y/N)
	Justification	Under the second stage of the Multiannual Management Plan (MAMP), the aim is the exploitation of plaice on the basis of maximum sustainable yield. The MAMP defines F_{MSY} as a rate equal to or no lower than 0.3. Subsequently ICES carried out an evaluation of MSY for plaice and concluded that fishing within the range F_{catch}		

PI 1.1.2		**Limit and target reference points are appropriate for the stock**		
		0.25 – 0.3 would be consistent with MSY (ICES 2012; WKFRAME, 2011). Since the range encompassed the MAMP target reference point of 0.3, this was considered to meet the requirements of SG c. However, a further evaluation of MSY has now established that the median point for F_{msy} is 0.19 and the likely range is from 0.13 to 0.27 (WKMSYREF-3, 2014). The new range is outside the MAMP target of 0.3 and so the target reference point no longer satisfies the requirements of SG c at 80.		
D	**Guide post**		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		Not relevant	
	Justification			
References		ICES. 2012. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 4-10 May 2011. ICES CM 2011/ACOM:13 WKFRAME. 2011. Report of the Workshop on Implementing the ICES Fmsy Framework (WKFRAME-2), Copenhagen, Denmark. ICES Document CM 2011/ACOM: 33. 109 pp. WKMSYREF-3. 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp.		
OVERALL PERFORMANCE INDICATOR SCORE: Two of three scoring guidelines met at 80				**75**
CONDITION NUMBER (if relevant):				**1**

Evaluation Table for PI 1.1.3

PI 1.1.3		**Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	NA		NA
	Justification	Scoring of this PI is not applicable, as PI 1.1.1 scores 80 or more.		
b	**Guide post**	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	NA	NA	NA
	Justification	Scoring of this PI is not applicable, as PI 1.1.1 scores 80 or more.		
c	**Guide post**	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	NA	NA	
	Justification	Scoring of this PI is not applicable, as PI 1.1.1 scores 80 or more.		
References		NA		
OVERALL PERFORMANCE INDICATOR SCORE:				**N/A**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.1

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Guide post	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	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 is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	Y	Y	N
	Justification	There is a well-defined harvest strategy which incorporates a range of components including a monitoring programme, regular evaluation of the state of the stock in relation to precautionary reference points and controls on the fishery through TACs, effort limitation and technical measures. The monitoring information feeds into an annual assessment which determines the state of the stock in relation to target and limit reference points. A TAC is set based on management objectives set out in the Multiannual Management Plan. In the short term this aimed to reduce fishing mortality progressively by 10% each year until inside safe biological limits. In the longer term, the strategy aims to exploit the fishery at MSY. The elements of the harvest strategy have worked effectively together towards achieving this aim and this satisfies SG 80.However SG 100 is not met because the MAMP does not clearly set out rules which would apply if SSB declines towards BLIM.		
b	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	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.
	Met?	Y	Y	Y
	Justification	ICES undertook a re-evaluation of the MAMP in 2010 (ICES 2010b) following evaluations by STECF (Simmonds et al, 2010) and IMARES (Miller and Poos, 2010) and concluded that the plan was precautionary for both plaice and sole. In addition, routine monitoring of the state of the stock is undertaken through collection of fisheries data, fisheries independent surveys and through the annual assessments. The improved status of the stock which is at historically high levels of SSB and reduction in F to within the range of F_{MSY} is evidence that it is achieving its objectives. The stock appears to be at or fluctuating around its management target levels with F below 0.3 since 2008. Moreover, the evaluation carried out clearly shows that the strategy has been fully evaluated and this meets the SGs at 80 and 100.		
c	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
	Met?	Y		
	Justification	Extensive monitoring of the state of the stock is undertaken through collection of fisheries data, fisheries independent surveys and through the annual assessments to ensure that the harvest strategy is working. In 2014 STECF was asked to carry out the evaluation of the management plan of sole and plaice in the North Sea. The evaluation reviewed the performance of the management plan in achieving its objectives, taking into account the most recent scientific information on developments in the relevant fish stocks and fishing fleets, and also any existing studies of the management plan. Quantitative analysis was updated from previous evaluations and new analysis were included whenever needed to clarify or support the evaluation. STECF considers that the suite of scientific analyses that have been performed over recent years provides a comprehensive overview of the mechanisms of the LTMP for North Sea plaice and sole, and the outcomes provide the basis for the revision of the plan required by Art.5. STECF notes that until the revision of the plan required in Art.5 is carried out, the current provisions remain in force and the harvest rules laid out in Art.7 and 8 to set fishing opportunities, have delivered Fs that are within the estimated FMSY range for both stocks, and are thus compatible with the stage-two objective of exploiting both stocks at rates consistent with MSY (STECF, 2014).		
d	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			N
	Justification	Elements of the harvest strategy have been reviewed including the reference points (WKMSYREF-3, 2014), input and output of the assessment (ICES 2015b) and the MAMP (ICES 2010b). Review of the MAMP resulted in agreement that stage two of the Management Plan should be implemented to ensure exploitation at MSY but it has not yet been updated to include new ICES MSY reference targets. This satisfies the SG at 80 but not at 100 as the HS has not yet been improved to take the new MSY target into account.		
e	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
References		ICES. 2010b. Request from the Netherlands on the evaluation of the long term management plan for plaice and sole in the North Sea (part 2). ICES Advice 2010. Book 6 Section 6.3.3.4 WKMSYREF-3. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp. ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13. Miller, D. C. M. and Poos, J. J. 2010. Combined Ex post and ex ante evaluation of the long term management plan for sole and plaice in the North Sea, including responses to ICES re-view. ICES Document CM 2010/ACOM: 62. 109 pp. Simmonds, E.J., Miller, D.C.M., Bartelings, H., Vanhee, W. 2010. Report of the Sub Group on Management Objectives and Strategies (SGMOS 10-06). Part b) Impact		

PI 1.2.1	There is a robust and precautionary harvest strategy in place	
	assessment of North Sea plaice and sole multi-annual plan. EUR 24629 EN, ISBN 978-92-79-18743-8. pp. 124. STECF, 2014 - Evaluation/scoping of Management plans - Evaluation of the multiannual management plan for the North Sea stocks of plaice and sole(STECF-14-03). 2014. Publications Office of the European Union, Luxembourg, EUR 26615 EN, JRC 89797, 57 pp.	
OVERALL PERFORMANCE INDICATOR SCORE: All scoring guidelines met at 80 and 1 of 3 met at SG 100		**90**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 1.2.2

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	Generally understood harvest 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.	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.	
	Met?	Y	N	
	Justification	The harvest control rules are set out under the Multiannual Management Plan (MAMP) for flatfish (EC 676/2007) and are fully consistent with the Harvest Strategy. The main mechanisms to contain the harvest of North Sea plaice are effort restrictions and the setting of an annual TAC under agreement between the EU and Norway. Under the first stage of the MAMP, the TAC is determined by selecting a fishing mortality that will ensure the spawning stock biomass will remain above precautionary levels. If the spawning stock biomass is outside the precautionary reference level B_{pa} of 230,000t, fishing mortality is required to be reduced annually by 10% (within a maximum annual variation in TAC of 15%). Under the second stage, the exploitation rate is reduced on an annual basis if the fishing mortality exceeds the management target of 0.3. Although these rules are designed to ensure that the SSB does not approach limit reference points, the MAMP does not specifically define how the exploitation rate would be reduced if the limit reference points were approached. As a result, the SG at 80 is not met.		
b	**Guide post**		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Y	N
	Justification	The main areas of uncertainty are associated with determining stock levels above which recruitment will not be impaired. The use of precautionary reference points for biomass and mortality ensures these areas of uncertainty are considered in the harvest control rules. Uncertainty in the stock-recruitment relationships for plaice have also been taken into account in evaluating the MAMP (Simmonds et al, 2010). However, the current assessment model (XSA) does not incorporate uncertainty in some of the input data such as landings and discard estimates, and so these uncertainties are not directly taken into account by the harvest control rules. In view of this, the SG at 100 is not considered to be fully met.		
c	**Guide post**	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	Y	Y	N

PI 1.2.2		There are well defined and effective harvest control rules in place
	Justification	The long term reduction in fishing mortality since the introduction of the MAMP and the steady increase in spawning stock biomass to reach historically record levels in recent years is evidence that the harvest control rules are effective. Fishing mortality in 2014 was estimated at 0.18 (ICES 2015a) which is within the range of F_{msy} and SSB was expected to reach around 1 million tonnes which is nearly six times the level at which the stock is considered to be at risk of recruitment impairment.
References		ICES. 2015a. Book 6, section 6.3.31, Plaice (*Pleuonectes platessa*) in Subarea IV (North Sea and Division III (Skagerrak),13 pp Simmonds, E.J., Miller, D.C.M., Bartelings, H., Vanhee, W. 2010. Report of the Sub Group on Management Objectives and Strategies (SGMOS 10-06). Part b) Impact assessment of North Sea plaice and sole multi-annual plan. EUR 24629 EN, ISBN 978-92-79-18743-8. pp. 124.
OVERALL PERFORMANCE INDICATOR SCORE: Only three of four SGs are met at 80		**75**
CONDITION NUMBER:		**2a**

Evaluation Table for PI 1.2.3

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Guide post	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	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 related to the current harvest strategy, is available.
	Met?	Y	Y	Y
	Justification	There is a comprehensive range of data to support the harvest strategy and control rules, including information on fleet structure, amount and age compositions of the landings and stock productivity. All plaice landings are recorded by all countries participating in the North Sea flatfish and mixed demersal fisheries. The UoC vessels in the fishery under assessment put all their landings through the electronic fish auctions which ensures that all data is made available to the authorities. The accuracy of landings data is continually monitored at national level and enforcement action taken against individuals where appropriate. The WGNSSK have not identified any problems in relation to the validity of these data. The landings are also well sampled by the participating countries who fully comply with the EU minimum sampling levels. Data on landings by sex are available from Netherlands and Belgium accounting for approximately 50% of the landings. Length at age, weight at age and maturity are available for the Netherlands, France, Germany, Denmark and Belgium, accounting for approximately 75% of the landings. There is extensive information on fleet composition and this is used to monitor and regularly reduce effort. There is detailed environmental data available for the North Sea although this data is not yet incorporated into assessment models used routinely. This meets the requirements of the first guideline at SG100.		
b	Guide post	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.	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.	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 inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	N
	Justification	Stock abundance is monitored through three surveys carried out annually which cover the main distribution of plaice in the North Sea and between them cover the period 1982-2014. These survey indices of abundance are used directly in calibrating the assessment. The surveys indicate differing trends in the development of the stock biomass and recruitment in recent years probably as a result of a shift in distribution of juvenile plaice, and splitting them by time series appears to provide better comparison in the estimates of stock abundance from year to year. The surveys also provide indices for estimation of recruitment to the		

PI 1.2.3		Relevant information is collected to support the harvest strategy		
		stock. There is an extensive programme of market sampling of the landings, which provides an estimate of age composition by sex and by quarter. Commercial LPUE data from the Dutch beam trawler fleet and the UK beam trawler fleet (excluding flagged vessels) is also used in exploratory runs in the assessment. All these indices are subject to rigorous scrutiny each year, by the assessment working group, and any uncertainties identified and addressed. As a result there have been several changes in the way that the indices are used and the time periods considered appropriate. Fishery removals are regularly monitored for discards. Discards of juvenile plaice are a major problem in the plaice fishery and observations indicate that the proportions discarded are up to 80% in number and 57% in weight (Uhlmann et al., 2012; van Reijden et al., 2014) and have increased in recent years. Discarding of plaice is a particular problem in the beam trawl fisheries which are traditionally targeted at sole and use an 80mm mesh size but there are also high levels of discards in other gears including twin-rig gear. Improvements in the level of sampling have occurred in recent years so that there are now 14 years of data from a range of countries which ICES considers to be “robust and consistent between years” (WKPLE, 2015). Sampling covers all the main gear types and provides good spatial and temporal coverage (Reijden et al. 2014). These improvements satisfy the SG at 80. There is an improving understanding of the uncertainties in the assessment but this is not yet sufficient to inform management decisions and so SG 100 is not considered to be met.		
c	**Guide post**		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	Good information is available on all other fishery removals from the stock		
References		WKPLE. 2015. Report of the Benchmark Workshop on Plaice (WKPLE), 23-27 February 2015, ICES Headquarters, Copenhagen, Denmark. ICES CM 2015\ACOM:33. 200 pp. Uhlmann, S.S., A. Coers, A.T.M. van Helmond, R.R. Nijman, R.A. Bol en K. van der Reijden Discard sampling of Dutch bottom-trawl and seine fisheries in 2012. CVO report: 13.015, 76pp. Reijden, K. van der, R. Verkempynck, R.R. Nijman, S.S. Uhlmann, A.T.M. van Helmond and A. Coers. 2014. Discard self-sampling of Dutch bottom-trawl and seine fisheries in 2013. CVO Rapport 14.007, 74pp		
OVERALL PERFORMANCE INDICATOR SCORE: All SGs met at 80 and one of two SGs at 100				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.4

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		Y	Y
	Justification	The assessment model used for this stock is based on an aged based extended survivors analysis (XSA), using landings and discards and calibrated with three fisheries independent survey indices. The XSA model has been used within ICES as an important tool for catch-at-age analysis for most demersal stocks. Careful consideration is given by the WGNSSK each year to the appropriateness of all aspects of the model parameters in relation to each species and these are detailed in the WG reports. The model uses appropriate biological data for the stock and nature of the fishery. Since 2004, the assessment has included age compositions of the discards. This has resulted in a more robust assessment and a reduction in bias. This meets the first element of SG80 and SG100.		
b	**Guide post**	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The assessment estimates spawning stock biomass and fishing mortality on an annual basis and these estimates are directly comparable against target and limit reference points.		
c	**Guide post**	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Y	Y	N
	Justification	The current assessment model (XSA) does not incorporate uncertainty in the input data such as landings and discard estimates derived from sampling. However, the input data are rigorously tested in benchmark assessments and a range of input data tested in trial runs during the assessment process. In addition, statistical models which can allow for observational error have also been carried out and showed a similar trend in SSB to that from the standard XSA model. Uncertainty is also accounted for in estimating target reference points and in the estimation of ranges of fishing mortality at MSY. This satisfies the SGF at 80 but the assessment model would need to model uncertainty in a probabilistic way to meet the SG 100.		
d	**Guide post**			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.

PI 1.2.4		**There is an adequate assessment of the stock status**		
	Met?			N
	Justification	The assessment is tested through a benchmark procedure where all input data and relevant assumptions are reviewed and some alternative assessment approaches such as the statistical catch at age model (SCA) explored. The assessment is generally robust from year to year with similar trends in SSB and F but there is still a tendency to underestimate F and recruitment and overestimate SSB. Alternative assessment approaches have been examined but not yet rigorously explored to the extent that they can be considered as alternatives to the existing XSA model.		
e	**Guide post**		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Y	Y
	Justification	The assessment is internally peer reviewed by an internal audit within the WGNSSK group itself and by the ICES Advisory Committee (ACOM). It is also peer reviewed for the EU by the Scientific, Technical and Economic Committee (STECF). This meets the SG 80. Regular benchmark assessments are carried out in which key assumptions, input data and models used in the assessment are tested and reviewed by working group members and external peer reviewers (WKPLE, 2015).		
References		WKPLE. 2015. Report of the Benchmark Workshop on Plaice (WKPLE), 23-27 February 2015, ICES Headquarters, Copenhagen, Denmark. ICES CM 2015\ACOM:33. 200 pp		
OVERALL PERFORMANCE INDICATOR SCORE: All SGs met at 80 and two of four at 100				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.1.1 (Sole)

PI 1.1.1		**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	Y	Y	Y
	Justification	The SSB for sole has fluctuated around the precautionary reference point for the last decade. The most recent estimate of SSB at the start of 2015 was 41,100t which is above the limit reference point of 26,300t and above to the precautionary reference point (Bpa) of 37,000t (ICES, 2015b, c). The fishing mortality has declined from a peak in 1996 but remains at 0.26 which is above its target reference point of 0.2 set under the EU Long Term Management Plan for plaice and sole (Council Reg (EC) 676/2007) and Fmsy estimated in WKMSYREF3 (ICES, 2014). Assuming a 17% CV (which is consistent with assumed uncertainty in estimating BPA), there is about a 96% probability that SSB2015 is above BLIM. Thus, SG 100 is met.		
b	**Guide post**		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		Y	N
	Justification	SSB is above the precautionary reference level and it can be considered to be at or fluctuating around its B_{msy} target level since 2012. SIb at SG100 is not met because SSB is just above Bpa, thus there is not an high degree of certainty (Pr>95%) that the stock has been fluctuating around its target reference point.		
References		EU. 2007. COUNCIL REGULATION (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Official Journal of the European Union L 157/1. ICES, 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp. ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13. ICES. 2015c. Book 6, section 6.3.46 Sole (*Solea solea*) in Subarea IV (North Sea),13 pp		
Stock Status relative to Reference Points				
		Type of reference point	**Value of reference point**	**Current stock status relative to reference point**

PI 1.1.1	**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**		
Target reference point	F_{MSY}	0.2	F0.255/F0.2 = 1.3
Limit reference point	B_{lim}	26,300t SSB	41,137/26,300 = 1.56
OVERALL PERFORMANCE INDICATOR SCORE: **The first and the second scoring guidelines are met at SG80, the first is met also at 100. The overall score is 90.**			**90**
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 1.1.2

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
A	Guide post	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	Y	Y	
	Justification	In 2010 ICES implemented the MSY framework for providing advice on the exploitation of stocks. The aim is to manage all stocks at an exploitation rate (F) that is consistent with maximum (high) long term yield while providing a low risk to the stock (WKFRAME 2011, ICES 2011). In 2014 the joint ICES-MYFISH Workshop (WKMSYREF3, ICES 2014) held place to consider the basis for FMSY ranges. The workshop convened again under the auspices of WKLIFE in march 2015. This eventually resulted in an F_{msy} range for sole of 0.13 - 0.27. The point value of F_{msy} was set at 0.2. Biomass and fishing mortality based reference points are used for the management of North Sea sole and are considered appropriate for the stock. They have been estimated for this specific stock taking uncertainty into account. Therefore SG80 Issue 1 was met.		
B	Guide post		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		Y	N
	Justification	There is no clear stock-recruitment relationship on which to base B_{lim}. Therefore the limit reference point is set below which there is an appreciable risk of impairing reproductive capacity. B_{lim} was defined by the breakpoint in a segmented regression of the stock–recruitment relationship, resulting in 26,300 t, and B_{PA} was set at 37,000 t using the default multiplier of 1.4. Due to the limited evidence, B_{lim} is not precautionary enough to meet SG 100.		
C	Guide post		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		Y	N
	Justification	F_{MSY} is defined at 0.2 and estimated as the median of stochastic MSY analysis assuming a Hockey stick stock recruit relationship. The stock is considered to be sustainably fished for any F on the range of 0.13-0.27. The F management target is		

PI 1.1.2		**Limit and target reference points are appropriate for the stock**		
		set at 0.2. The robustness in the F_{MSY} estimate of 0.2 has been evaluated comprehensively. Simulations analyses take into account uncertainty in the input parameters, such as weight at age, maturity and stock numbers at age. On the basis of these analysis the WGNSSK has concluded that F = 0.2 is an appropriate value for North Sea sole as it results in long term yields which are consistent with MSY and pose low risk to the productivity of the stock. This finding is supported by all analysis including simulation tests, uncertainty in input parameters and uncertainty in stock recruit relationships. Scoring Guidepost 100 was not reached due mainly to: 1. Testing for robustness is not carried out within ecosystem modelling. 2. The estimation of the target reference point does not take in to account plaice. Sole is exploited together with plaice.		
D	**Guide post**		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		Not relevant	
	Justification			
References		EU. 2007. COUNCIL REGULATION (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Official Journal of the European Union L 157/1. ICES, 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp. ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13. ICES. 2015c. Book 6, section 6.3.46 Sole (*Solea solea*) in Subarea IV (North Sea),13 pp WKFRAME 2011. Report of the Workshop on Implementing the ICES Fmsy Framework (WKFRAME-2), Copenhagen, Denmark. ICES Document CM 2011/ACOM: 33. 109 pp. WKMSYREF-3 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp.		
OVERALL PERFORMANCE INDICATOR SCORE: The three scoring guidelines met at 80				**80**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.1.3

PI 1.1.3		Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	NA		NA
	Justification	Scoring of this PI is not applicable, as PI 1.1.1 scores 80 or more.		
b	**Guide post**	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	NA	NA	NA
	Justification	Scoring of this PI is not applicable, as PI 1.1.1 scores 80 or more.		
c	**Guide post**	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	NA	NA	
	Justification	Scoring of this PI is not applicable, as PI 1.1.1 scores 80 or more.		
References		NA		
OVERALL PERFORMANCE INDICATOR SCORE:				**N/A**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 1.2.1

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
Scoring Issue		SG 60	SG 80	SG 100
a	Guide post	The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.	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 is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.
	Met?	Y	Y	N
	Justification	The ultimate objective of the harvest strategy is to exploit the stock at the maximum sustainable yield in the long term. To achieve this management is targeting for a fishing mortality rate that is consistent with F_{MSY}. Science (i.e. ICES and STECF) inform on the stock status and the harvest strategy respond in relation to the state of the stock. TAC and fishing effort limitation (i.e. Kw days at sea) are the main management controls measures used. The TAC is set to limit the fishing mortality to the desired level. The maximum levels of fishing effort available for fleets targeting sole (and plaice) are controlled on the basis of Chapter 3 of the multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea (COUNCIL REGULATION (EC) No 676/2007). Effort restrictions are controlled by a kW-day system (2009 Council Regulation (EC) N° 43/2009), in which different amounts of kW-days are allocated within each area by members state or different group of vessels depending on gear and mesh size. Effort ceiling are updated annually. Other technical measures constrain the sole fishery, including mesh size regulations, gear restrictions and a closed area (Plaice Box and inshore waters). The elements of the harvest strategy have worked effectively together towards achieving this aim and this satisfies SG 80. However, SG 100 is not met because the MAMP does not clearly set out rules, which would apply if SSB declines towards BLIM.		
b	Guide post	The harvest strategy is likely to work based on prior experience or plausible argument.	The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.	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.
	Met?	Y	Y	N
	Justification	The performance of the harvest strategy has not been fully evaluated yet (SG 100 not met), but evidence exists that shows that it should achieve its objectives (SG 80 is met). A new harvest control rule (see 1.2.2) is being implemented designed to raise SSB above the precautionary level (phase 1 of the management plan) and to reach exploitation rates that produce the maximum sustainable yield (phase 2 of the management plan). The harvest strategy has been evaluated and has been found to be consistent with the precautionary approach. Recent evidence show that the stock biomass has increased and has been above precautionary limits over the last two years and F is decreasing.		

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
c	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Y		
	Justification	Extensive monitoring of the state of the stock is undertaken through collection of fisheries data, fisheries independent surveys and through the annual assessments to ensure that the harvest strategy is working. In 2014 STECF was asked to carry out the evaluation of the management plan of sole and plaice in the North Sea. The evaluation reviewed the performance of the management plan in achieving its objectives, taking into account the most recent scientific information on developments in the relevant fish stocks and fishing fleets, and also any existing studies of the management plan. Quantitative analysis was updated from previous evaluations and new analysis were included whenever needed to clarify or support the evaluation. STECF considers that the suite of scientific analyses that have been performed over recent years provides a comprehensive overview of the mechanisms of the LTMP for North Sea plaice and sole, and the outcomes provide the basis for the revision of the plan required by Art.5. STECF notes that until the revision of the plan required in Art.5 is carried out, the current provisions remain in force and the harvest rules laid out in Art.7 and 8 to set fishing opportunities, have delivered Fs that are within the estimated FMSY range for both stocks, and are thus compatible with the stage-two objective of exploiting both stocks at rates consistent with MSY (STECF, 2014).		
d	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Y
	Justification	An MSE was carried out following the implementation of the management plan. The MSE was deficient on some points. It did not take full account of all uncertainties, notably the retrospective bias which indicates a structural error in the assessment model. In 2010 a second MSE was preformed which took account of the deficiencies of the 2008 evaluation and also considered the latest data and assessment models for the stocks. The result of the 2010 MSE concluded that the multi annual plan for North Sea sole and plaice is consistent with the precautionary approach (Miller and Poos, 2010)		
e	Guide post	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
References		EU. 2007. COUNCIL REGULATION (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Official Journal of the European Union L 157/1. ICES, 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp. ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM		

PI 1.2.1	There is a robust and precautionary harvest strategy in place	
	2015/ACOM:13. Miller, D.C.M and Poos, J.J. 2010. Combined Ex post and ex ante evaluation of the long term management plan for sole and plaice in the North Sea, including responses to ICES review. ICES Document CM 2010/ACOM: 62. 109 pp STECF, 2014 - Evaluation/scoping of Management plans - Evaluation of the multiannual management plan for the North Sea stocks of plaice and sole(STECF-14-03). 2014. Publications Office of the European Union, Luxembourg, EUR 26615 EN, JRC 89797, 57 pp.	
OVERALL PERFORMANCE INDICATOR SCORE: All scoring guidelines met at 80 and 1 of 3 met at SG 100		**85**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 1.2.2

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	Generally understood harvest 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.	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.	
	Met?	Y	N	
	Justification	Well defined harvest control rules are outlined within the multi annual management plan for North Sea sole and plaice ((EC) N° 676/2007 of 11 June 2007). The management plan is divided into stages based on the determination of the current stock status. The first stage has the objective of rebuilding the stock to safe biological limits by reducing fishing mortality by 10% per year with a constraint on the change to the TAC of 15% (article 3). When the stocks have remained above the safe limit (precautionary level) for two successive years (Article 5), the second stage would be implemented. The second stage sets targets for the fishing mortality based on the principle of maximum sustainable yield, and aims to apply a fishing mortality less than or equal to 0.2 on ages two to six years (Article 4). As a result, the SG at 80 is not met.		
b	**Guide post**		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Y	Y
	Justification	Simulation testing of the management plan (MSE) (Miller and Poos 2010; Simmonds et al., 2010) considered how robust the harvest control rule was too many uncertainties, and concluded that the plan is precautionary. These analyses take into account uncertainty in the input parameters, such as weights at age, maturity and stock numbers at age. The MSE simulations performed by Miller and Poos (2010) consisted of a detailed age-structured population model, including a range of different stock dynamics around the base case model. This uncertainty incorporated in stock recruitment function, measurement error and variability in the fishery. Several alternative stock dynamics and mixed fishery scenarios were tested. A range of management scenarios examined the likely impacts of varying aspects of the multi-annual plan on the stocks and the fishery, including different candidate F targets for each stock. The Simmonds analysis (Simmonds et al. 2010, 2011) models recruitment stochastically based on multiple stock recruitment models for the populations. Differently from plaice in the case of sole the stock has not been joined with Skaggerak.		
c	**Guide post**	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.

PI 1.2.2		There are well defined and effective harvest control rules in place		
		exploitation.	harvest control rules.	
	Met?	Y	Y	N
	Justification	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules. Evidence of this is the completion of the phase 1 of the management plan. However SG 100 is not met as F is not decreasing rapidly enough toward F_{msy}.		
References		EU. 2007. COUNCIL REGULATION (EC) No. 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Official Journal of the European Union L 157/1. ICES, 2014. Report of the Joint ICES–MYFISH Workshop to consider the basis for FMSY ranges for all stocks (WKMSYREF3), 17–21 November 2014, Charlottenlund, Denmark. ICES CM 2014/ACOM:64. 147 pp. ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13. Miller, D.C.M and Poos, J.J. 2010. Combined Ex post and ex ante evaluation of the long term management plan for sole and plaice in the North Sea, including responses to ICES review. ICES Document CM 2010/ACOM: 62. 109 pp Simmonds, E.J., Miller, D.C.M, Bartelings, H., Vanhee, W. 2010. Report of the Sub Group on Management Objectives and Strategies (SGMOS 10-06). Part b) Impact assessment of North Sea plaice and sole multi-annual plan. EUR 24629 EN, ISBN 978- 92-79-18743-8. Pp. 124.		
OVERALL PERFORMANCE INDICATOR SCORE: **One of three SGs 80 is not met.**				**75**
CONDITION NUMBER:				**2b**

Evaluation Table for PI 1.2.3

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	Guide post	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	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 related to the current harvest strategy, is available.
	Met?	Y	Y	Y
	Justification	A comprehensive range of information, including some that may not be directly relevant to the current harvest strategy, is available. As well as data used directly in the stock assessment (catch-at-age, survey and LPUE data), additional information includes changing patterns of growth, and the relative spatial distribution of juvenile and adult sole in response to the Plaice Box management initiative. However, more refined data on the type of gear used is needed in logbooks because of a rapid increase in the usage of new gears (i.e. pulse trawls) and the unknown consequences for the catchability of sole This meets the requirements of the first guideline at SG100.		
b	Guide post	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.	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.	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 inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Y	Y	N
	Justification	The data required by the harvest control rule are monitored with high frequency and a high degree of confidence. The main information required to support the stock assessment are the total landings, age and weight composition of the landings, abundance surveys together with age and weight composition of the survey catch. However, the understanding of some of the uncertainties in the data is incomplete (e.g. Natural mortality considered as constant) and some of the data used to model the maturity ogive for example, is potentially out of date. Therefore issue 2 SG 100 is not met.		
c	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		Y	
	Justification	Information on all removal from all fleets and nations is well recorded and is appropriate for their use in the assessment of the stock.		
References		ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM		

PI 1.2.3	Relevant information is collected to support the harvest strategy
	2015/ACOM:13. ICES. 2015c. Book 6, section 6.3.46 Sole (*Solea solea*) in Subarea IV (North Sea),13 pp
OVERALL PERFORMANCE INDICATOR SCORE: **All SGs met at 80 and one at 100.**	**90**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 1.2.4

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		Y	N
	Justification	The North Sea sole assessment was recently benchmarked (ICES, 2015c). Changes made during the benchmark were (i) the adoption of a statistical catch-at-age model (AAP-model, Aarts and Poos, 2009), that is able to reconstruct historical discards, and (ii) the removal of the Dutch commercial LPUE, due to the introduction of new gears (e.g., pulse trawling and fuel-saving wings) in the Dutch beam trawl fleet. The new assessment is very similar in terms of SSB and recruitment, but has a smoother pattern of F over time. The previously used XSA assumes the catch-at-age matrix is complete and without error. The AAP method is a variety of statistical catch-at-age model that uses splines to estimate the selectivity patterns in the surveys and for the catch-at-age matrix. Spline smoothers are used to describe the F-at-age matrix, the catchabilities at-age of the tuning indices, and the discards fraction-at- age. The main reason for changing from XSA to AAP was to be able to incorporate the incomplete time-series of discards consistently into the assessment. Age compositions of the landings and discards are well sampled and the quality of the surveys is adequate. However, current survey indices do not cover the south-western part of the stock distribution. Effort should be made to derive a combined survey index. This meets the first element of SG80 but not at SG100.		
b	**Guide post**	The assessment estimates stock status relative to reference points.		
	Met?	Y		
	Justification	The assessment estimates spawning stock biomass and fishing mortality on an annual basis and these estimates are directly comparable against the reference points.		
c	**Guide post**	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Y	Y	N
	Justification	The current assessment model (AAP) incorporates uncertainty in the input data derived from sampling. Since 2011, the use of pulse trawls in the Dutch fishery has increased sharply to 74 vessels (of which 65 >221 kW) and only eight traditional beam trawls are now left. The increased use of pulse trawls and other adaptations like fuel-saving wings may affect catchability and selectivity of North Sea sole. Though this effect has not yet been quantified, it will increase assessment uncertainty. The stock assessment does not include probabilistic outputs indicating		

PI 1.2.4		There is an adequate assessment of the stock status		
		uncertainties. Therefore Issue 2 SG 100 is not met.		
d	**Guide post**			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			Y
	Justification	The assessment is tested through a benchmark procedure where all input data and relevant assumptions are reviewed and some alternative assessment approaches such as the SAM model which is a state–space assessment model. An advantage of using AAP and SAM over XSA would be that they take into account (and show) the uncertainty of the assessment inputs and outputs. The SAM model has been run in some years in parallel to the main assessment model for the sole stock, but it was not presented or discussed at WKNSEA 2015 (ICES, 2015d).		
e	**Guide post**		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Y	Y
	Justification	The assessment is internally peer reviewed by an internal audit within the WGNSSK group itself and by the ICES Advisory Committee (ACOM). It is also peer reviewed for the EU by the Scientific, Technical and Economic Committee (STECF). This meets the SG 80. Regular benchmark assessments are carried out in which key assumptions, input data and models used in the assessment are tested and reviewed by working group members and external peer reviewers (ICES, 2015d).		
References		Aarts, G., and Poos, J. J. 2009. Comprehensive discard reconstruction and abundance estimation using flexible selectivity functions. ICES Journal of Marine Science, 66: 763–771. ICES. 2015b. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015. ICES CM 2015/ACOM:13. ICES. 2015c. Book 6, section 6.3.46 Sole (*Solea solea*) in Subarea IV (North Sea),13 pp ICES. 2015d. Report of the Benchmark Workshop on North Sea Stocks (WKNSEA), 2–6 February 2015. ICES CM 2015/ACOM:32.		
OVERALL PERFORMANCE INDICATOR SCORE: **All SGs met at 80 and two of four at 100**				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.1

PI 2.1.1		**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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main retained species are likely to be within biologically based limits (if not, go to scoring issue c below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue c below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	Y	Y	N
	Justification	The main retained species for pulse trawl 80mm mesh size (> 5%, based on 2013 and 2014 landings data) are plaice (42.1% and 54.9%, respectively), sole (34.8%-24.3%, respectively) and dab (5.6 %- 5.2 %, respectively). These percentages are based on landings data, provided by the client (see Table 3.4.2.2, Section 3.4.2 of main report). Sole and plaice are considered target species and are covered under P1 for each relevant UoC. They are main retained species under the respective UoC where they are not included in the P1, i.e. plaice is a main retained for UoC1 (sole) and sole is a main retained species for UoC 2 (plaice). A description of these species in relation to this PI is given under 1.1.1 and both score 90 for 1.1.1. Dab is the only other main retained species, and is not assessed under any Principle 1. This is not only based on the landings data provided by the client (Table 3.4.2.2 – for 2014) but also based on extrapolated catch data (calculations provided by IMARES using reference fleet data for 2014, see Table 3.4.2.1 in Section 3.4.2). Dab: The 2014 landings data provided by the client showed that dab was a main retained species, at 5.2%. Extrapolating this to total catch using data provided by IMARES from the reference fleet, gives 17.8%. The survey index, recent trend and overall value indicate that dab is highly likely that dab is above the point where recruitment might be impaired ad therefore highly likely to be within biologically based limits. This meets SG80. No target reference point is defined for dab and therefore SG100 requiring a high degree of certainty is not met. At SG 100 all retained species are considered. The additional (minor) retained species include cod, turbot, brill, flounder and lemon sole. For these and other retained species (see Table 3.4.2.1) the stock status is uncertain, except. North Sea cod, which is well estimated, but is not fluctuating around its target reference point. Therefore considering all retained species, it is not highly certain (>80% quartile) that at least 6 of these species (scored as elements: see CR1.3 27.10.5) are within biologically based limits and fluctuating around their target reference points. Therefore, the SG100 scoring issue is not met for sufficient elements to score higher than 80,		
b	**Guidepost**			Target reference points are defined for retained species.
	Met?			N

PI 2.1.1		**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**		
	Justification	Target reference points are not defined for all retained species. The list of retained species for 2014 pulse trawl fishery is given in table 3.4.2.1. Defined target reference points, exist for sole and plaice (which are covered under P1 for respective UoC), cod, haddock, hake and saithe. SG100 is not met for the other species listed as retained.		
c	**Guidepost**	If main retained species are 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 main retained species are 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.	
	Met?	Y	Y	
	Justification	The main retained species are highly likely to be within biologically based limits, so this scoring issue is not used (ICES Advice 2015).		
d	**Guidepost**	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.		
	Met?	Y		
	Justification	For the majority of retained species, the status is poorly known. The main measure in place is the limit on sole and plaice landings, which limit fishing effort. However, with the level of discarding in this fishery, limits on landings may not be effective in controlling exploitation. If any species would be determined as at biologically based limits, it is unclear what specific action this fishery could take to allow recovery, apart from increasing mesh size. However, there are some measures in place to reduce bycatch and discarding. The pulse/beam trawl fishermen are obliged to use a different panel in the anterior part of the net, which is 5.4m long and has large meshes of at least 180mm (instead of square mesh panel – SMP - the CVO pulse trawl fishery is exempted from the obligation to use a square mesh panel, since it has been technically proven that the net kept breaking near the SMP). This measure was taken within the framework of the cod recovery plan, in order to reduce bycatch of roundfish. The details of this panel can be found in article 5, clause 3 in EC regulation 2056/2001 Furthermore, studies have shown that with pulse trawling catch efficiency goes up for sole (spend less time trawling, covering a smaller area), although less so for		

PI 2.1.1		**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**
		catching plaice (Interview with ILVO, 1 July 2015, B. Verscheuren), and so further reducing by-catch levels. Scoring justification: a few (plaice, sole, haddock, hake, saithe) of species considered under retained species score 100, most others do not and therefore a score of 85 is awarded.
References		ICES Advice for Dab 2015; EC regulation 2056/2001, Article 5, Clause 3; Interview with ILVO, 1 July 2015, B. Verscheuren

OVERALL PERFORMANCE INDICATOR SCORE: Scoring justification: a few (plaice, sole, haddock, hake, saithe) of species considered under retained species score 100, most others do not and therefore a score of 85 is awarded.	**85**
CONDITION NUMBER (if relevant):	**-**

Evaluation Table for PI 2.1.2

PI 2.1.2		**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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, 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.	There is a partial strategy in place, if necessary, 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 a strategy in place for managing retained species.
	Met?	Y	Y	N
	Justification	In addition to plaice and sole, dab is the only other main retained species in this fishery (based on data from 2014 and 2013). Dab is managed in a combined TAC with flounder, which is considered a partial strategy. However, the majority of dab which is caught is discarded, so the discard rate is a major determinant of the dab catch and this is not controlled by the TAC. The TAC alone does not effectively limit fishing mortality on this species. The partial strategy for managing dab includes species specific measures, area management and technical measures including the following: • TACs and Quotas – for example, a limit on sole and plaice catches limits fishing effort, thus affecting retained species bycatch. • Minimum landing sizes and minimum marketing standards • Closed areas / temporary real time closures to protect juveniles • Technical gear restrictions • Cod recovery plan and days at sea • Ban on high grading SG80 is met Considering all retained species at SG100, strategies are not in place for many of these species and so SG100 is not met.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	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.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N

PI 2.1.2		**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**		
	Justification	Management of dab and flounder under a combined species TAC could prevent effective control of the single - species exploitation rates. However, the overall recent trend in biomass based on the North Sea trawl survey information, is positive and the survey index is high compared to historical levels. There are no reference points for biomass or fishing pressure, but a “low data” harvest control rule is operating based on survey trend. However, as noted above, it applies to the landed catch across two species, so it is unclear how effective it will be in this case. All retained species are landed and count directly against TAC where appropriate, and are marketed, thus weight and sales notices are available to verify catches. The reliability of the systems of recording catches at port of landing is well established and can be verified through independent inspections. Testing is conducted by direct monitoring of every landing. In relation to the main retained species, there is some objective basis for confidence that the partial strategy will work. Although ICES has raised issues with the combined dab/flounder TAC, other measures are in place that contribute to the partial strategy, Current information about the dab in the North Sea indicates that the stock is within biologically based limits giving an objective basis for confidence that the partial strategy will work. Therefore SG80 is met. According to ICES Advice on several of the retained species, there appears to be little stock information directly about these, which does not allow testing that would support high confidence that a strategy would work. SG100 is not met.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	Evidence of recording of retained bycatches in the pulse trawl sole and plaice fishery is provided by the data available, recorded in on-board e-logs, and verified by IMARES. Self-recorded reference fleet data, compiled by IMARES, confirm the levels of retained bycatch for the species concerned. Therefore SG80 is met. In order to meet SG100, there would need to be greater certainty on the stock status of all retained species. This is not the case and SG100 is not met.		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			N

PI 2.1.2		**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**		
	Justification	There is only a partial strategy. Not enough is known about the stock status of many of the retained species to assess whether any strategy is achieving an objective.		
e	**Guidepost**	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant
	Justification	Not relevant		
References		ICES. 2015a; client landings data; ICES 2014 NSSK working group report;		
OVERALL PERFORMANCE INDICATOR SCORE: Scoring justification: a few (plaice, sole, haddock, hake, saithe) of species considered under retained species score 100, most others do not and therefore a score of 85 is awarded.				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.3

PI 2.1.3		**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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	Accurate quantitative data has been provided to allow determination of volumes and value of all retained species landed. This data is verified via IMARES, including the main retained species, dab. This data is available for 2013 and 2014. Qualitative and some quantitative information is available on the dab stock in the North Sea (refs WGNSSK 2015, ICES stock Advice 2015c). However, it is not known what proportion of the catch has been discarded, as only landings data was provided, not catch data. The self sampling reference fleet data provided by IMARES allows some extrapolation of this for 2014, as landings and discards and thus catch data is provided. Further explanation on how this data was used is given in the main section of this report above (Section 3.4,2) SG80 is met Stock status information is limited or not available for many of the other retained species and SG100 is not met.		
b	**Guidepost**	Information is adequate to qualitatively assess outcome status with respect to biologically based limits.	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.
	Met?	Y	Y	N
	Justification	Information from landings data provided by the client and verified by IMARES is sufficient to estimate outcome status with respect to biologically based limit for the main retained species, dab. Discard information is available from the self-sampling reference fleet for 2014 (Table 3.4.2.2) and data on discards from the wider fleet has been collated since 2002. According to ICES (2012b), dab is a Category 3 data limited stock, for which survey indices (or other indicators of stock size such as reliable fishery-dependant indices; e.g. lpue, cpue, and mean length in the catch) are available that provide reliable indications of trends in stock metrics such as mortality, recruitment, and biomass. SG80 is met For most of the retained species concerned the landings are very small indeed, ranging between <0.1% to 3.2% for 36 out of the 24 retained non-target species in 2014. It is not known from the landings data provided by the client what proportion and which species of the total catch was discarded, before the rest was retained. Although some discard information is available from the self-sampling reference		

PI 2.1.3		**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**		
		fleet collected by IMARES, comparative data only covers few of the species which are retained. Information is therefore not sufficient to quantitatively estimate outcome status with a high degree of certainty for all retained species. SG100 is not met.		
c	**Guidepost**	Information is adequate to support measures to manage main retained species.	Information is adequate to support a partial strategy to manage main retained species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N
	Justification	Information is comprehensive and fully quantified for all retained species landed. There are 2 years of data available on pulse trawl retained landings for this fishery, thus the time series is short. The information is adequate to support a partial strategy to manage the main retained species of dab. SG80 is met SG100 is not met, because the information available is not adequate (e.g. estimates of total catch, rather than landings) to evaluate with a high degree of certainty whether the strategy is achieving its objective for all retained species.		
d	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species.
	Met?		Y	N
	Justification	Records from the on-board data collection system for recording all retained species for this pulse trawl fishery have been available for 2013 onwards – 2 years of data can be analysed now to assess changes in risk levels. The collection of such data is embedded and continues, thus building up a time series. SG80 is met. Monitoring of all retained species is not conducted in sufficient detail to assess ongoing mortalities to all retained species, as there is limited information on how much of that species was discarded, when some was retained. For example, the reference fleet data provided by IMARES shows that turbot was both landed and discarded, which together constitutes 'ongoing mortality' . Such detail is not provided in the landings data. SG100 is not met. It is possible, with the new regulations on discarding, that information on total mortality for these species will be improved and become adequate for future harvest strategies across all species.		
References		Landings data from client; IMARES 2014 reference fleet data		

PI 2.1.3	**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**	
	ICES 2012c; ICES WGNSSK 2015; ICES 2015c;	
OVERALL PERFORMANCE INDICATOR SCORE:		**80**
CONDITION NUMBER (if relevant):		**-**

Evaluation Table for PI 2.2.1

PI 2.2.1		**The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	Y	Y	N
	Justification	There are no <u>main</u> discarded species for pulse trawl 80mm mesh size (i.e. > 5% of total catch). Based on 2014 reference fleet data plaice, dab and sole are discarded, but are accounted for under P1 (where target species of the UoC) and under 2.1 as these are retained. Therefore this meets SG80. Table 3.4.2.1 lists all discarded species (i.e. those in addition to species listed in landings data and hence considered under 2.1 as retained species) based on reference fleet data. For sandeel, herring, sprat and mackerel, biologically based limits are set. No biologically based limits are set for the other species listed. The ICES advice for sandeel is based on distinct areas within the North Sea. For Dogger Bank area and South-Eastern North Sea areas, stocks are estimated to be below stock reference points (ICES, 2015f). Herring and sprat in the North Sea along with North East Atlantic mackerel are all reported by ICES to be above limit reference points (ICES, 2015g, 2015h, 2015i). For the other discarded species stock status is uncertain. Scored as separate elements (see CR1.3 27.10.7) therefore most minor discarded species do not meet SG100.		
b	**Guidepost**	If main bycatch species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	If main bycatch species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	Y	Y	
	Justification	There are no main by-catch species. This meets SG60 and SG80.		

PI 2.2.1		**The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups**		
c	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	Y		
	Justification	There are some measures in place to reduce bycatch and discarding. The pulse/beam trawl fishermen are obliged to use a different panel in the anterior part of the net, which is 5.4m long and has large meshes of at least 180mm (instead of square mesh panel – SMP - the CVO pulse trawl fishery is exempted from the obligation to use a square mesh panel, since it has been technically proven that the net kept breaking near the SMP). This measure was taken within the framework of the cod recovery plan, in order to reduce bycatch of roundfish. The details of this panel can be found in article 5, clause 3 in EC regulation 2056/2001 SG60 is met. Scoring justification: 3 out of the 15 species considered here score 100 and therefore a score of 85 is awarded.		
References		EC regulation 2056/2001, Article 5, Clause 3; client landings data ICES 2015f Sandeel (*Ammodytes* spp.) in Divisions IVb and IVc, SA 1 (Central and South North Sea, Dogger Bank), Advice February 2015 ICES 2015g Herring (*Clupea harengus*) in Subarea IV and Divisions IIIa and VIId (autumn spawners) (North Sea, Skagerrak and Kattegat, Eastern English Channel). Advice May 2015 ICES 2015h Sprat (*Sprattus sprattus*) in Subarea IV (North Sea), Advice June 2015 ICES 2015i Mackerel (*Scomber scombrus*) in Subareas I–VII and XIV and Divisions VIIIa–e and IXa (Northeast Atlantic), Advice September 2015.		

OVERALL PERFORMANCE INDICATOR SCORE: Scoring justification: 3 out of the 15 species considered here score 100 and therefore a score of 85 is awarded.	**85**
CONDITION NUMBER (if relevant):	**-**

Evaluation Table for PI 2.2.2

PI 2.2.2		**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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main bycatch 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 a partial strategy in place, if necessary, that is expected to maintain the main bycatch 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 a strategy in place for managing and minimizing bycatch.
	Met?	Y	Y	N
	Justification	There are no main by-catch species in this fishery based on the 2014/2013 reference fleet data and therefore SG80 is met. There is a partial strategy in place for managing bycatch species in the form of linked measures including area management and technical measures: • TACs and Quotas – for example, a limit on sole and plaice catches limits fishing effort, thus affecting species bycatch. • Minimum landing sizes and minimum marketing standards • Closed areas / temporary real time closures to protect juveniles • Technical gear restrictions, such as the panel in the anterior part of the net • Cod recovery plan and days at sea: The cod management plan aims to rebuild the cod stock. Associated measures include quota restrictions in other mixed fisheries, effort controls, increased enforcement, strict bycatch limits, minimum permitted codend mesh size, etc • Ban on high grading. While this ban on high grading is not easily enforceable at sea, it should be detectable through monitoring the size distribution of landings • Observer programmes, as described in Section 3.4.2 • CVO Code of Conduct Some studies indicate that pulse trawling itself appears to be more efficient in catching sole, hence there is less time at sea, and thus reduced opportunity for causing more discards of target species, as well as other species(Taal & Hoefnagel, 2010). The measures, as outlined above, amount to a partial strategy for the bycatch species listed in table 3.4.2.1, as they may result in less bycatch of the species (SG80 is met), but they do not represent a strategy to minimis bycatch of these species (SG100 is not met).		

PI 2.2.2		**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**		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	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.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Y	Y	N
	Justification	Given the above details it is assessed by the team that there are partial strategies in place for managing and minimizing bycatch (discards), and there is some evidence through data collected as part of the observer programme within the remits of the EU-DCF (data collection framework) that the partial strategy will work (SG80 is met). The available data (mainly that collected by IMARES via the reference fleet) results in an estimation of discard levels for bycatch species. This does not represent testing of a strategy for these species and the stock status of most remains unknown (SG100 is not met).		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Y	N
	Justification	While there is some evidence that the partial strategy is being implemented successfully (through verifiable data collection programmes and observers) (SG80 is met), a strategy is yet to be developed and implemented (SG100 is not met).		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			N
	Justification	A strategy is yet to be developed and implemented. Currently there is no evidence of an objective being defined and achieved (SG100 is not met).		
References		IMARES reference fleet data for 2014; CVO vessel Code of Conduct; Taal K., Hoefnagel E, 2010. Pulse trawl on flatfish as an alternative for beam trawl. The economic performance and the environmental impact of the innovative. Pulse trawl in comparison to the conventional Beam trawl. LEI The Hague NL. First International		

PI 2.2.2	**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**
	Symposium on Fishing Vessel Energy Efficiency E-Fishing, Vigo, Spain, May 2010
OVERALL PERFORMANCE INDICATOR SCORE:	**80**
CONDITION NUMBER (if relevant):	**-**

Evaluation Table for PI 2.2.3

PI 2.2.3		**Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	Y	Y	N
	Justification	There are no main bycatch species. SG80 is met Qualitative and some quantitative information on the bycatch species is available through IMARES reference fleet reports. Some discard information is available from reference fleet data on the catch of bycatch species, but this is not enough to evaluate the consequences of all the affected populations. Stock status information is limited or not available for many of these species. SG100 is not met.		
b	**Guidepost**	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	Y	Y	N
	Justification	There are no main discarded (bycatch) species. SG80 is met Information from the reference fleet for 2014 on discards from pulse trawling (provided by the client and calculated by IMARES). For the small pelagic species listed in 2.2.1, information is adequate to estimate outcome status with respect to biologically based limits, as the level of discarding is very small compared to directed fisheries. However, the majority of discard species do not have stock assessments and outcome status cannot be quantitatively estimated wit hrespect to biologically based limits. SG 100 is not met.		
c	**Guidepost**	Information is adequate to support measures to manage bycatch.	Information is adequate to support a partial strategy to manage main bycatch species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Y	Y	N

PI 2.2.3		**Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch**		
	Justification	There are no main discard species. SG80 is met. Available information is from a reference fleet. The data fully quantified all discarded species on those trips. The level of sampling is consistent with DCF sampling requirements. However, it is not evident that this information is sufficient to support a strategy to manage retained species as such a strategy has not been developed. To evaluate a strategy is achieving its objective to a high degree of certainty, a higher level of sampling may be required (SG100 is not met).		
d	**Guidepost**		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 effectively of the strategy).	Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.
	Met?		Y	N
	Justification	There are no main bycatch species. SG80 is met. The collection of reference fleet data is embedded and continues, thus building up a time series, which will allow the detection of any increase in risk to the bycatch species. However, monitoring of bycatch data is not conducted in sufficient detail to assess ongoing bycatch mortality. SG100 is not met.		
References		Reference fleet data, provided by IMARES Landings data from Client		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				**-**

Evaluation Table for PI 2.3.1

PI 2.3.1		**The fishery meets national and international requirements for the 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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	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.	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.
	Met?	Y	N	N
	Justification	Table 3.4.2.3 in section 3.4.3 presents the ETP species list being considered for these UoCs. Data on pulse trawl / ETP interactions were collected by the client in 2012, specifically to assess the presence of ETPs in the catch and the results are presented in section 3.4.3. Eel and shad, as well as Common skate (*Dipturus batis*) and Sturgeon were caught. Starry ray was recorded by the reference fleet in 2012. Annex H in Rasenberg (2014) gives the average number/hour of discarded fish species in the pulse trawl observer trips. The list mentions Twait Shad (*Alosa fallax;* <0.1 per hour). Populations of ETP species are well studied in the North Sea, with considerable levels of work undertaken in relation to the regular monitoring of fisheries interaction through the deployment of onboard scientific observers, capture of anecdotal information, focused national study/research programmes and a range of EU funded research programmes, across many different fisheries (see Section 3.4.3 for detailed information on ETP species). In addition, In March 2015 the CVO extended its ETP logbook scheme for the CVO pulse fleet, the results are shown in Table 3.4.3.5 of Section 3.4.3. Based on the limited studies to date, the known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species SG60 is met. Specific studies on the effects of this new trawl gear type, using electricity on the ETPs listed are not identified. A study by Desender et al (2015) showed the effect of pulse on Thornback rays and lesser-spotted dogfish to be minimal, One may infer that this could also be the case for the Common skate and the starry ray species. No studies have been made available to show the effect of pulse gear on the survivability of other ETPs caught (sturgeon, eel and shad). The ETP logs being completed by the CVO vessels is now building essential information on the level of interaction with ETPs from this gear. However, considering that ETP-focused studies or onboard observations of effects (e.g. ETP survivability) are not available, it is not possible to evaluate the effects of this fishery on ETP species. One cannot therefore state the effects are known and highly likely to be within national and international requirements. SG80 is not met.		

PI 2.3.1		**The fishery meets national and international requirements for the 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**		
b	**Guidepost**	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	Y	Y	N
	Justification	Known direct effects include ETPs getting caught in the gear. Data collected by the client in 2012 and 2015 (see section 3.4.3) and Rasenberg (2014) showed that comparatively few ETPs were caught. The 3 porpoises recorded in 2015 were actually in various states of decomposition, or already dead (without further description). Considering the small numbers of ETPs directly caught, this is unlikely to create unacceptable impacts when extrapolated across the fleet. SG60 is met. In addition to capture in the gear, direct effects may include disturbance due to the gear or fishing activity. Considering the ETP species listed are all mobile species. For marine mammals, the available evidence (and anecdotal information) suggests the direct impact of pulse gear would be negligible given their ability to avoid the gear and the limited extent of field strength beyond the gear itself. There is no evidence to suggest disturbance by activity has a significant impact on these species. The direct effects are therefore highly unlikely to create unacceptable impacts on marine mammals. For other ETP species, such as the elasmobranch species listed, avoidance of the gear is less likely (as evidenced by the catch data) and therefore capture in the gear is the main direct impact. The levels of bycatch of these other ETP species (see tables 3.4.3.2 and 3.4.3.3) indicates that the fishery is highly unlikely to create unacceptable impacts on ETP species. SG80 is met. The level of information via the ETP logbook scheme (2012 and part of 2015) is not currently sufficient to provide the high degree of confidence for SG100 to be met. However, the extent of sampling (over 25% of the fleet) should provide that confidence over the coming years if this detailed reporting (including all ETP species) is continued.		
c	**Guidepost**		Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		N	N
	Justification	Indirect effects primarily affect benthos dwelling ETPs such as rays. Indirect effects would include such issues as how does the pulse affect the survivability of benthic egg cases of elasmobranchs, or egg masses of other benthic species, when it passes across. Other indirect effects include the effect of electric pulse on ETP prey items. These would include benthos dwelling invertebrates on which ETPs feed. Studies on early life stages and in situ experiments to explore impacts on a range of benthic invertebrates (rather than 1 or 2 species of invertebrates in laboratory experiements) that would help to identify possible indirect impacts are currently limited (see section 3.4.4). Further research is ongoing and planned, including the		

PI 2.3.1		**The fishery meets national and international requirements for the 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**
		Pilot study associated with the most recent EU derogation to grant further pulse trawl vessels, should address this. SG80 is not met.
References		Desender et al (2015); Rasenberg, M. et al (2014); CFP Regulation EU 1380/2013; Council Regulation (EU) 2015/104; ICES 2014 a,b,c,d,
OVERALL PERFORMANCE INDICATOR SCORE:		**65**
CONDITION NUMBER (if relevant):		**3**

Evaluation Table for PI 2.3.2

PI 2.3.2		**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 harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Y	Y	N
	Justification	The fishery has a strategy in place made up of several measures that are designed to manage impacts of commercial fisheries on ETP species specifically. Measures to manage ETP that are considered fundamental to the strategy include: *Regulatory measures:* i) Annual EU fishing opportunities regulations.EU Reg 2015/104. The regulation prevents directed fishing for ETP species by prohibiting the landing, retaining on board or transhipment of Basking shark (all waters), angelshark (all EU waters) and Common skate (EU waters of ICES division IIa and ICES subareas III, IV, VI, VII, VIII, IX and X) by EU registered fishing vessels and which prohibits the retaining onboard of spurdog captured within EU waters. The implication of this is that all common skate, spurdog and angelshark captured in EU waters may not be retained on board and must be promptly released unharmed to the extent practicable. Under the regulation, fishers shall be encouraged to develop and use techniques and equipment to facilitate the rapid and safe release of the species. ii) Fisheries control measures include the licensing of fishing vessels, Individual Transferable Quotas, species TAC's and national quotas, effort limitations as well as technical control measures/EU fishing effort controls that set out limits for fishing effort by mobile gears according to mesh size used . iv) Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, otherwise known as the 'Habitats Directive'. Article 11 of the Habitats Directive requires that "*Member States shall undertake surveillance of the conservation status of the natural habitats and species referred to in Article 2 with particular regard to priority natural habitat types and priority species.*" This includes all species of cetacean and pinniped occurring in European waters. Additionally, Article 12 also requires that "*Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a) [which includes all cetaceans]. In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned*." v) Council Regulation (EC) No 812/2004 laying down measures concerning incidental catches of cetaceans in fisheries. The regulation specifies a number of		

PI 2.3.2		**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 harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
		measures that must be taken within fisheries that are known to feature potentially significant cetacean bycatch. Although the present fishery is not subject to prescribed at sea monitoring undertakings under the regulation, it is considered that this regulation forms an important part of EU strategy to manage impacts of fishing on certain ETP species and it is thus considered part of the overall strategy. The CVO has designed a comprehensive Code of Conduct which addresses the management of ETP species, including identification material and training, where needed. SG80 is met The strategy does not achieve above national and international requirements – it implements what is required by law. SG100 is not met.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.	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.
	Met?	Y	Y	N
	Justification	Knowledge in relation to cetacean and pinniped bycatch rates and population status of potentially affected species is adequate to form an objective basis for confidence that the management strategy will work with respect to these species. Information in relation to North Sea Harbour porpoise populations as well as Harbour seal and Grey seal populations suggests that none are declining or threatened and catches in demersal trawl are extremely rare A number of published studies suggest that post capture survival rates for small sharks and rays that are released are reasonably high (Mandelman and Farrington 2007, Revill et al.2005). A critical factor in determining the likely survival rate is the weight of the codend at time of hauling which is related to the bulk of the catch. Higher bulk catches appear to be associated with lower survival rates. SG80 is met There is some quantitative information, based on surveys conducted in 2012, and part of 2015 (see tables in section 3.4.3). A longer time series is needed to support high confidence. SG100 is not met		
c	**Guidepost**		There is evidence that the strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.

PI 2.3.2		**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 harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
	Met?		Y	Y
	Justification	All available information, on the development and implementation of ETP related regulations and the compliance with regulations and licence requirements all provide evidence that the ETP conservation strategy is implemented successfully in relation to this plaice and sole pulse trawl fishery. In addition published data analysis was available (Rasenberg 2014), as well as CVO data collected in 2015 was made available. This is clear evidence that the strategy is being implemented successfully. SG80 & SG100 are met.		
d	**Guidepost**			There is evidence that the strategy is achieving its objective.
	Met?			N
	Justification	In order to meet this SG, a time series over several years would need to be available, rather than just one year's worth of data (2012), and 3 months' worth in 2015. However, the CVO is in the process of establishing a detailed ETP data collection system, which should provide much of the information in the future. SG100 is not met		
References		Rasenberg, M. etal 2014; CFP Regulation EU 1380/2013; Council Regulation (EU) 2015/104; Section 3.4.3 of the main report on ETP background; ICES 2014 a,b,c,d,d; Mandelman, J.W., and M.A. Farrington. 2007; Council Directive 92/43/EEC; Council Regulation (EU) 2015/104; Revill et al.2005; CVO ETP study;		
OVERALL PERFORMANCE INDICATOR SCORE:				**85**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.3.3

PI 2.3.3		**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.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.	Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.
	Met?	Y	Y	N
	Justification	Increasingly, due to the gradual introduction of EU landings obligation measures and prohibited landings measures (EU fishing opportunities Regulation 2015), more data is becoming available on spurdog, skates and rays to be incorporated in ICES Advice. A detailed study in 2012, monitoring the pulse fishery, also recorded all discarded fish species, including ETP species (Rasenberg 2014). The results showed a small amount of ETPs caught. The ETP-log is being further enhanced to account for new ETP listed species and implemented across over 25% of the pulse fleet since March 2015. The evaluation to date shows that comparatively few ETP species have been caught. This both qualitatively and quantitatively allows the impact of fishing to be estimated for ETP species. SG80 is met SG100 is not met, as the data series is short and thus a high degree of certainty is not possible.		
b	**Guidepost**	Information is adequate to broadly understand the impact of the fishery on ETP species.	Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.	Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Y	N	N
	Justification	Both the Rasenberg (2014) study conducted in 2012, and the recently implemented CVO ETP-log set up data collection were quantitative and provided enough detail to broadly understand the impact of the fishery on ETP species. SG60 is met. The effect of trawling per se on the demersal ETP species (the rays and skates as listed in Section 3.4.3, Table 3.4.3.1) have been observed over many years. Fishery related measures such as discarding restrictions, release, and quota restrictions have not made a significant difference to, for example stock status of the Common Skate, (ICES Advice 2015, Book 6.3.5) which remains depleted. Considering that as yet little is known about the long term and indirect effects of pulse trawling on ETPs, it cannot be stated that there is sufficient information to determine whether the fishery may be a threat to protection and recovery of the ETP species.		

PI 2.3.3		**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.**		
		SG80 is not met.		
c	**Guidepost**	Information is adequate to support measures to manage the impacts on ETP species.	Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.	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.
	Met?	Y	N	N
	Justification	The detailed monitoring programme conducted in 2012 (Rasenberg et al 2014), consisting of both self sampling and observer monitoring, on the catch composition of the Dutch pulse fishery targeting flatfish also included data on ETPs. The 2014 reference fleet data on catches and discards listed one ETP species (Table 3.4.2.1 – Starry ray, see also Table 3.4.2.3 for differentiation between components). In 2012 CVO conducted a pulse trawl monitoring program and part of that was a weekly 24-hour registration of 19 vulnerable species (Table 3.4.3.4), of which ten were ETP species, whereby five of those 10 species were caught. The CVO ETP-log started in March 2015, and participating vessels recorded amounts of ETPs in the catch. The information collected is not sufficient to measure trends and support a full strategy – however, the recently implemented CVO ETP-log, together with relevant identification material available to the fishers, will change that. SG80 is not met.		
References		Council Regulation (EU) 2015/104 – fishing opportunities in EU waters for 2015; Client information pack and data; Rasenberg et al 2014; ICES 2014f; Section 3.4.3 of the main report for more details.		
OVERALL PERFORMANCE INDICATOR SCORE:				**65**
CONDITION NUMBER (if relevant):				**4**

Evaluation Table for PI 2.4.1

PI 2.4.1		**The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	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.
	Met?	Y	partial	N
	Justification	Being a demersal species living on the seabed, trawl gears used to fish for groundfish species such as sole and plaice can reasonably be expected to have an impact on benthic habitats, as the gear must establish close contact with the seabed in order to work efficiently. The fishing gear used in the fishery under assessment comprises relatively robust demersal trawl gear. Codends may have chaffing gear fitted for protection on the underside. A detailed description of the gear has been provided in Section 2 of this report. In general, gear is designed for fishing on mud, sand, and sandy mud seabed sediments that dominate in the areas where the fishery takes place (see Fig 26 main Section 3.4.4 of the report). Seabeds are relatively homogeneous throughout the area or may comprise a mosaic of sediments. No extensive areas of hard seabed are fished routinely although isolated patches of rock and stones/gravel may be encountered. **Evaluation of outcome indicator as per CRv1.3** The MSC defines “highly unlikely” as being no more than 30% probability. Serious or irreversible harm is also clearly defined in the MSC methodology as being “gross change in habitat types or abundances ..... (Which would) take much longer to recover than the dynamics in an unfished situation would imply (e.g. implying some sort of regime shift ..... e.g. loss / extinction of habitat types). In order to answer these questions, key considerations include: • the type of ground that the fishery takes place – see Fig.24 and Fig.26 • the presence of sensitive, vulnerable habitats, in particular including slow growing, habitat-forming species and the impact of the fishing gear on these (see Section 3.4.4) • the likely rate of recovery if left unfished (see discussion in Section 3.4.4). To inform this question the assessment team have referred to a range of sources, such as habitat maps, published gear impact studies, known locations of vulnerable species, spatial information (VMS data) on the exact fishing location of certified fleets (see Section 3.4.4). **The area of the fishery:** Information from the VMS vessel plots (machiels, 2015), shows that the majority of fishing effort by the pulse trawl fishery catching sole and plaice takes place in waters less than 100m deep, on mainly sandy and muddy-sand sediments. These are moderate energy environments subject to natural disturbance by currents and more substantial disturbance by storm events. The Machiels (2015) analysis shows the footprint of the pulse fishery was on approx 23% of North Sea habitats. In terms of the habitats most favoured by pulse vessels, with approx. 35% of sand to muddy-sand (habitat code 35) fished. 28% of mud to sandy-mud (code 33).		

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
		This analysis is based on the VMS from vessels fishing pulse and 2014 was the year that the fleet expanded with a further 42 licences. This fleet expansion occurred during 2014 and therefore the VMS does not reflect a full year's fishing pulse by the full fleet as it is now. It does, however, give a reasonable indication of the comparative coverage in terms of types of grounds fished. It should also be noted that, although the analysis adopts a comparatively refined spatial resolution of 2km^2, presence of a vessel fishing in an area (as dictated by the VMS) does not equate to that whole area being impacted by the gear. If the actual footprint of the gear is considered, the area covered is far less than the percentages reported above. **Sensitive / vulnerable habitats:** OSPAR (www.OSPAR.org) lists a number of sensitive habitats in the northeast Atlantic, including the North Sea. A series of maps which clearly show the location and distribution of sensitive habitats in the OSPAR area are available on the OSPAR website) http://www.emodnet-seabedhabitats.eu/.A review of these maps was conducted, comparing locations of known sensitive / vulnerable habitats, with the location of fishing vessel activities (from VMS). The habitats examined on the OSPAR map included *Lophelia pertusa* reefs, *Sabellaria spinulosa* reefs, deep sea sponge aggregations, carbonate mounds, horse mussel beds (*Modiolus modiolus*), seapens and burrowing megafauna communities. This review showed that there was negligible overlap between the location of the fishery under assessment and known locations of sensitive or vulnerable seabed habitats and the assessment team have therefore concluded that there is no evidence that the fishery is likely to have significant impact on any of these habitats (certainly on the scale implied by serious & irreversible), considering the location of the fishery and the level of available information with regard to sensitive and /or vulnerable seabed communities and habitats. In terms of impacts on sand and muddy-sand sediments, research indicates that that the pulse fishery causes re-suspension and disturbance to these common and widely distributed habitat types in the North Sea (see discussion in Section 3.4.4, including Benthis study and Teal et al 2014). **Rate of Recovery:** Rees et al (2007) review long term changes for North Sea benthos in many areas that have been affected by trawling. The rate at which the seabed may recover from trawling impacts is difficult to estimate as most areas are fished on an ongoing basis. The available research highlights key patterns which influence the overall rate of recovery. Generally, communities dominated by long-lived, slow growing and late maturing faunal species that may also be characterised by irregular recruitment and poor potential for rapid re-colonisation through asexual reproduction can be expected to be less resilient to the effects of trawling disturbance. Such communities are more typical of hard seabeds such as cobble. Callaway et al (2007) suggests that recovery of benthic communities from trawling over hard seabeds probably takes in the region of 5 to 10 years. These are the types of habitats discussed above (sensitive and vulnerable), which data suggests are not significantly present in the area of the fishery under assessment. Other species and habitat types will of course be faster to recover and hence less vulnerable to impacts of trawling. In dynamic sandy sediments, recovery is likely to be faster since the associated communities are accustomed to higher levels of natural disturbance (Kaiser et al, 1998). Hiddink (2014) produced a model of the effect of beam trawling on production and biomass of benthic invertebrate communities in the Southern North Sea. The model used describes the effect of trawling on the biomass and production of epifaunal and infaunal invertebrate communities on sediments. The results suggest that all of the benthic habitats commonly encountered would recover from beam trawl impacts within a few years. The BENTHIS study shows the physical impact of the pulse

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
		trawl to be significantly less than the beam trawl due to shallower penetration. This reduced impacted would be further enhanced with the shorter tows reported for the pulse. However, the Hiddink model considers traditional benthic trawls, and associated heavy gears. This fishery is conducted with electric pulse, and the effect of pulse trawling on the biomass and production of epifaunal and infaunal invertebrates is not modelled. It can be inferred that the physical impact of pulse trawling on habitats is significantly reduced compared to beam trawl and the habitats encountered would recover to not cause serious or irreversible harm. The additional impact of electricity in this regard cannot be inferred. Section 3.4.4 in the main report summarises a number of studies on the effects of pulse on individual species. The studies so far do not indicate harmful impacts to the extent that habitat form and function would be seriously or irreversibly harmed. Studies to date do not show the effect over time of pulse gear on epifaunal and infaunal organisms and therefore direct evidence from the fishery is lacking. Theory and experimental results suggest that the impact of electricity reduces as the size of organism reduces and so the impact on microbes within the benthos could be expected to be minimal. However, the research does not cover the effect of pulse on epifaunal and infaunal organisms over a sufficiently long time series to provide evidence that this fishery does not cause irreversible harm to habitat function. Adopting a precautionary approach, it is assumed that the additional impact of electricity on benthic habitats is more significant in relation to form and function than traditional trawls. Despite the lack of direct evidence of pulse trawl impacts on benthic habitats, the overall footprint of the fishery in relation to those habitats should also be used to determine the extent of impacts. The available spatial information (Machiels, 2015) suggests the footprint in 2014 is sufficiently limited that it is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. However, as Machiels notes, 2014 was the year that saw a switch to pulse trawl throughout the year suggesting the results may not be representative of a full year's fishing by the full fleet. As gear impact is inferred and spatial footprint assumed, SG 80 is not fully met and a partial score of 70 is awarded. **In conclusion** The majority of pulse trawl fisheries landing sole and plaice take place over seabed sediments in the south eastern part of the North Sea. Furthermore it could be shown (VMS tracks) that fishing effort does not overlap with important known areas of vulnerable or sensitive species. Sandy and sandy-muddy seabeds have been shown as likely to be comparatively quick to recover from the effects of trawling. Research considering pulse trawl impacts specifically, such as BENTHIS, is ongoing. However, the available evidence to date finds that the pulse trawl is lighter and has less surface penetration than many other towed gears. Given the known physical impact of the gear (shallower penetration and reduced volume of debris), the recoverability of the common habitats encountered and the much-reduced footprint of the fishery (mainly through reduced overall effort but also slower towing speed and shorter hauls), the physical impact of the pulse trawl is highly unlikely to cause serious or irreversible harm to the form or function of these habitats. There is less evidence on the impact of electricity on these habitats, but theory and experimental results to date indicate no significant increase to the effect compared to the physical impacts of the gear. Even taking a highly precautionary approach, the VMS analysis of 2014 data indicates that the footprint of the fishery in relation to the total coverage of these habitats makes it highly unlikely serious or irreversible

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function
		harm would occur. However, greater certainty is needed of that fishing footprint than the VMS results from a single partial fishing year. SG80 is not fully met and a partial score of 70 is given.
References		www.OSPAR.org; Rees et al (20070; Callaway et al (2007); A.Rijsdoorp 2015 International Dialogue meeting; Kaiser et al, 1998; Hiddink (2014); Section 3.4 in main report; VMS data
OVERALL PERFORMANCE INDICATOR SCORE:		**70**
CONDITION NUMBER (if relevant):		**5**

Evaluation Table for PI 2.4.2

PI 2.4.2		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		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	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 a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Y	Y	N
	Justification	The MSC FAM v2 defines a partial strategy as one that represents a cohesive arrangement, which may comprise one or more measures, an understanding of how they work together to achieve an outcome and an awareness of the need to change the measures should they cease to be effective. Article 2 of Council Regulation (EC) No 1380/2013 (31) provides that the CFP is to "*implement the ecosystem-based approach to fisheries management so as to ensure that negative impacts of fishing activities on the marine ecosystem are minimised*". The CFP implements a range of restrictions on fleets and vessels that are expected to ensure the fishery does not pose a risk of serious or irreversible harm to seabed habitat types. European fisheries legislation also serves to protect seabed habitats from adverse fishing impacts in two further ways. In the first instance regulations set clear limits in terms of maximum fishing effort (KW days, as per the Cod recovery Plan), fishery removals (TAC's, national quotas), vessel size and power (kW) as well as overall fleet size. Through imposing restrictions, fishery regulations significantly limit the extent to which fishing may give rise to negative seabed impacts. Regulations are revised annually and the regulatory process is kept informed through fisheries control mechanisms and by wide ranging ongoing marine research programmes, focused studies and regular data collection and analysis. EU Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora required the Netherlands to create a network of protected areas within which the most sensitive and /or vulnerable habitats and species are protected. The Netherlands have already designated as well as continue to designate a number of areas in the North Sea for the presence of Annex I seabed habitats (including Reef and Sandbanks which are slightly covered by seawater at all times) and Annex II species (see also Section 3.4 for more details). Marine spatial planning to deliver habitat protection in European waters is being developed under the Marine Strategy Framework (2008/56/EC) – MSF to complement the habitat protection being implemented through the Habitats Directive. Implementation of all elements of the Habitats Directive will eventually lead to the creation of an ecologically coherent network of protected areas (the Natura 2000 network). The strategy includes a guideline that 20% of each habitat should be protected and that appropriate levels of management will be provided to ensure that the aim of achieving and maintaining 'Good Environmental Status', GES, is met. In order to achieve GES by 2020, each Member State is required to develop a strategy for its marine waters (or Marine Strategy). In addition, because the Directive follows an adaptive management approach, the Marine Strategies must be kept up-to-date and reviewed every 6 years. Furthermore, according to the Habitats Directive, the conservative status of a natural habitat will be taken as "favourable" when: - its natural range and areas it covers within that range are stable or increasing, and - the specific structure and functions which are necessary		

PI 2.4.2		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		
		for its long-term maintenance exist and are likely to continue to exist for the foreseeable future. Under Article 11, member states must undertake surveillance of the conservation status of the natural habitats and species referred to in the Directive, with particular regard to priority natural habitat types and priority species. The MSF also requires member states to report to the Commission on implementation every 6 years (Article 17). The measures detailed above are cohesive and therefore constitute a partial strategy for protecting seabed habitats from serious or irreversible harm in the areas fished (SG80 is met). The main elements of European fisheries and nature conservation legislation constitute a cohesive arrangement which will limit the potential for fishing to have negative impacts; while at the same time protecting vulnerable habitats. In both cases, ongoing research, consultation and monitoring can reasonably be expected to lead to management action should any measures cease to be effective. SG100 is not met as there is not an explicit strategy in place for managing this pulse fishery and its impact on habitats.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Y	Y	N
	Justification	Fisheries regulations and limitations on fishing activity are implemented through national agencies. Together with ongoing development and implementation of conservation site management plans in relation to SAC designations, these are considered likely to work based on plausible argument and a consideration of the positive effects that restrictions on fishing in marine protected areas have had in other parts of Europe. VMS data provides specific knowledge in relation to the spatial distribution of the demersal pulse trawl fisheries and the general seabed habitats where these occur, along with knowledge relating to the distribution and extent of OSPAR listed sensitive seabed habitats in the North Sea, adding further confidence that the measures are likely to work.. Furthermore, the Netherlands government wants to protect 10 to 15 percent of the Dutch part of the North Sea from seabed disturbance. To realise this objective, the State has marked out the Frisian Front and Central Oyster Grounds areas in the Marine Strategy, Part 1 (2012)[17] as search areas for spatial protection measures. The CVO has introduced a more detailed data collection scheme for ETPs which it is implementing across the fleet, this involved species and habitat identification training and environmental and marine strategy awareness raising amongst the fishers. SG60 is met. The results of a recent IMARES study (2015) to compare the distribution of fishing intensity between pulse and beam trawlers in the North Sea, showed that with pulse trawling, fishing intensity is reduced, as measured in kWdays at sea. This is partly		

[17]http://www.noordzeeloket.nl/en/projects/european-marine-strategy-framework-directive/situation/national/economic-analysis-2010/economische_analyses_KRM_2014.aspx

PI 2.4.2		**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**		
		as a result of decommissioning of beam trawlers between 2010 and 2014, as well as a result of deployment of pulse trawl vessels. The reduction in intensity has a direct effect on the harm risk to habitat. The measures that make up the partial strategy to manage seabed impacts are considered likely to work as limitations on fishing effort have been shown to have reduced the overall footprint and intensity of fishing. SG80 is met. There is no overall strategy identified relating to the pulse gear that can be tested to achieve the SG100 score.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		N	N
	Justification	Discussions with the Dutch Ministry of Economic Affairs confirmed that management planning for the Netherland's network of Natura 2000 sites is well underway for the Coastal areas, but not yet for Cleaver Bank and Frisian Front (Interview with K.Verbogt, Min.Economic Affairs), where pulse trawlers also operate. Pulse trawlers are treated as TBB gear (regular beam trawlers). Eurocutters (<221kW), which also trawl using pulse gear, are allowed to fish within the coastal zone (12-mile zone). Fig. 3.4.4.4 shows the VMS fishing tracks for 2014, which appear to include not yet implemented Natura 2000 sites (Zeeuwse Banken) – see Fig. 3.4.4.3. It is not clear from the information provided as part of this assessment how pulse trawling is going to be regulated in those areas. There is a reported general high level of compliance with fishery regulations by the Dutch demersal pulse trawling fleet (Compliance reports were provided by client). There is comprehensive VMS coverage on all vessels allowing control authorities to monitor activity in real time. It can therefore be expected that the habitat management measures, including spatial closures to fishing, will be complied with. As yet, there is no evidence that the partial strategy is being implemented successfully, as habitat management plans (including fishing measures) are still to be implemented. SG80 is not met.		
d	**Guidepost**			There is some evidence that the strategy is achieving its objective.
	Met?			N
	Justification	At this stage there is only a partial strategy.		
References		EU Council Directive 92/43/EEC; Council Regulation (EC) No 1380/2013; Marine Strategy Framework (2008/56/EC);		

PI 2.4.2	**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**
	http://www.noordzeeloket.nl/en/projects/european-marine-strategy-framework-directive/situation/national/economic-analysis-2010/economische_analyses_KRM_2014.aspx; VMS data; Client information pack; Ministerie van Infrastructuur en Milieu – Kaartenbijlaage Natura 2000 beheerplan Waddenzee, Periode 2015-2021; Client MSC Notification report; IMARES 2015, Report C146A/15
OVERALL PERFORMANCE INDICATOR SCORE:	**75**
CONDITION NUMBER (if relevant):	**6**

Evaluation Table for PI 2.4.3

PI 2.4.3		**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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Y	Y	Y
	Justification	OSPAR collate data from a wide range of European institutions in relation to the distribution of 14 main vulnerable and sensitive marine habitats. Data are collated and used to generate maps of the location of the main habitat of concern, and maps are available of most areas in the Northeast Atlantic including the North Sea. Data are submitted to OSPAR on an ongoing basis by organisations within countries that are signatories to the Convention and who are researching their seabed environment on an ongoing basis. The Mapping European Seabed Habitats (MESH) project also collated a wide range of data for five member countries that participated in the project. The project has produced a web resource that can be used to build detailed seabed habitat maps for most European waters of the North East Atlantic. The information available to assist in managing the impacts of the fishery on seabed habitats team through this medium is considered relevant and has been taken into account in evaluating the fishery under this Performance Indicator. Also of relevance is The Digital Atlas of the North Sea. This document has collated the findings of many environmental surveys and studies in relation to the North Sea into a single useable source. In order to produce a habitat map showing North Sea sediments, the results of a broad range of studies were collated and a Broadscale seabed habitat map of the North Sea is available. The area of coverage includes all that within which the vessels under assessment routinely fish. The map is based on high quality and high resolution data and confirms that the CVO pulse trawlers fish on mainly sandy and occasionally muddy sand areas. Seabed habitat maps generated using these tools have been considered in the evaluation of the potential impacts of the trawl fishery in relation to the habitat performance indicator. They have been found to be useful and adequate for the purpose of identifying the likely main habitats in the areas fished. SG100 is met		
b	**Guidepost**	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	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 of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.

PI 2.4.3		**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**		
	Met?	Y	N	N
	Justification	There is detailed VMS information to infer spatial overlap of habitat with fishing gear. Technical information about the pulse gear is documented and known, and there is a broad understanding through laboratory and some field research on the nature of the main impacts of gear use on the main habitats. SG60 is met The first part of SG80 requires sufficient data to allow the nature of impacts of the fishery on habitats to be identified. A Pilot Project for the discards ban, in conjunction with the 42 extra pulse derogations in early 2014 (Derogations 43-84: EU Council regulation 1380/13 (article 14)), is still being set up: "*A precondition for this pilot project was that more information would be gathered on the gear and its effects. From 2015 onwards, a research program will be set-up and executed, aimed at monitoring catches and pulse trawl parameters, ecological effects, geochemical effects, etc".* This first part of SG80 is not met. Reliable data is being collected on the spatial extent of interaction, and the timing and location of use of the fishing gear (VMS data, e-logs). Under EU technical measures, pulse gear is currently being treated as regular trawl gear, TBB, rather than having its own gear designation (Ministry of Economic Affairs interview, 30.06.2015) which therefore does not allow to tease out fishery specific impacts on habitats. At the request of the client, however, IMARES were commissioned to provide this for the pulse fleet using 2014 data (Machiels, 2015). The expansion of the fleet by a further 42 vessels occurred during 2014. This does not constitute a full year's fishing by the full fleet. While this shows the necessary data can be extracted to enable adequate assessment, the available information cannot currently be considered reliable on the spatial extent, timing and location of use of gear. The second part of SG80 is not met. SG80 is not met.		
c	**Guidepost**		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).	Changes in habitat distributions over time are measured.
	Met?		Y	Y
	Justification	VMS data are collected routinely for the fishery and the distribution of effort can be monitored from this. Days at sea and vessel quotas are also routinely monitored via DCF arrangements. This data is available for assessing the scale of risk to habitat on an ongoing basis. Landings data are recorded by ICES statistical square and are recorded on electronic logbooks by the fleet. These data are available for 'fine-tuning' of habitat		

PI 2.4.3		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
		management initiatives should they prove to be necessary in the future. European research into impacts of fishing gear on benthic communities and seabed habitats is ongoing, and in this case it is being further refined through the Pilot Project as part of the Derogation. Greater levels of research associated with marine protected area designations (such as Natura 2000) are being undertaken and will be required to continue into the future under the Marine Strategy Framework. Because of this it is reasonable to expect that our understanding of the impacts of mobile fishing gears will develop and be further refined in the future. Habitat mapping of the North Sea continues nationally and internationally and relevant maps continue to be refined. SG80 and SG100 are met.
References		OSPAR 2000; www.eur-oceans.eu; www.noos.cc; www.zeeinzicht.nl http://www.eea.europa.eu/data-and-maps/figures/european-marine-regions-and-the; VMS maps; DCF; Section 3.4.4 of main report; landings data; Client information pack; International Dialogue Meeting 2015; http://jncc.defra.gov.uk/page-4524;
OVERALL PERFORMANCE INDICATOR SCORE:		**75**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.5.1

PI 2.5.1		**The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	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.	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.	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.
	Met?	Y	partial	N
	Justification	The function and structure of the North Sea ecosystem is well known[18], as is the role of sole and plaice within this ecosystem. CEFAS recently published an ecosystem model of the North Sea (Mackinson and Daskalov, 2007) which documents the trophic level and predator-prey relationship between 68 different species, from cetacean to polychaetes (see also Section 3.4.4). Over the course of the 20th century, the fish food web in the North Sea has been altered by a combination of fishing and climate, and the structure of the secondary production demand at the base of the foodweb has shifted the towards zooplankton due to depletion of benthos-consuming fish, leading to an increase in macrobenthos production. The 'Large Fish Indicator' (LFI), set as an Ecological Quality Objective (EcoQO) by OSPAR to assess the status of fish communities, has a 'reference point' of 0.3, which compares with an LFI of around 0.38 in 1902-1905 and less than 0.05 in 2001 (indicating a general loss of large animals), but had risen to 0.22 by 2008. The percentage of 20 indicator fin-fish stocks considered to have full reproductive capacity and being harvested sustainably has risen from 10% or less in the early 1990s to 20-30% in the 2000s. A major factor in this recent recovery in the North Sea is the decline in fishing pressure due to large-scale fleet decommissioning programmes, TACs based on better information about stocks including discarding estimates, and improved co-ordination of compliance and enforcement. From this, one can conclude that fish stocks in the North Sea, whilst heavily impacted towards the end of the 20th century, are currently improving. This will be further enhanced by the phasing in of the landings obligation for demersal fisheries by 2019. Despite estimated annual fishing mortalities of over 50%, many benthic invertebrate species still occur in the southern North Sea, which suggests that their populations survived at the highest level of additional mortality at the peak of beam trawling in the 1990s. This is no guarantee that all benthic invertebrate species originally present have been able to withstand these levels of fishing mortality. It may well be that there has been a baseline shift in the kinds of benthic species present since the industrial levels of demersal trawling in the North Sea. Presumably, the species still present possess life-history characteristics (e.g. early reproduction, high reproductive rate, and low longevity) that enabled them to maintain a population in spite of the trawling activities. Densities of species that do not possess such life-history characteristics might have decreased because of commercial trawling over the previous 150 years to such low levels that they are now rare. However, there is little comparative data from when demersal trawling was first introduced on an industrial scale in the 1960s.		

[18] Mackinson, S. and Daskalov, G., 2007. An ecosystem model of the North Sea to support an ecosystem approach to fisheries management: description and parameterisation. Sci. Ser. Tech Rep., Cefas Lowestoft, 142: 196pp

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function
		From this it could be inferred that trawling per se meets SG60 and SG80. The ecosystem structure and function was not irreversibly damaged by trawling. The available evidence (e.g. Soetaert, 2015) indicates that the evolution to pulse trawling away from beam trawling would further reduce the potential to disrupt ecosystem components with reduced benthic impact and less overall effort. Electric pulse as part of the trawling activity has been introduced relatively recently. Quirijns et al (2015) reviewed research to date and concluded that while available results are encouraging, several topics require further investigation, including: • Indirect (or: delayed) mortality; • Non-mortal effects; • Effects on reproduction; • Long term effects on species that encounter pulse trawl gear and on their populations; • Minimum and maximum values for pulse characteristics (is there a 'safe range'?); • Effects of pulse fishing on early life stadia of marine organisms that reproduce in shallow water; • Effects on seabed, substrate and water column: can the use of pulse result in dissolving toxic chemicals? There are currently several planned studies on the broader scale consequences of pulse trawling in time and space to contribute to answering some of these research questions, which will allow inference of the effects of electric pulse trawl on the North Sea ecosystem. These studies are not underway yet (see Section 3.4.4 for details). A.Rijsdoorp of IMARES (International Dialogue meeting, July 2015) confirmed that the knowledge base of the broader effects of pulse fishing are still in its infancy, and that one is not yet able to answer broader questions of the effects of pulse on the structure and function of benthic ecosystem and its effects on bacteria and biochemistry of this system. As noted under 2.4.1, the spatial extent of the fishery means that benthic impacts are unlikely to result in overall impacts and, by extension would not be expected to contribute to the disruption of underlying ecosystem components. However, the limited knowledge on such impacts leaves the potential for unexpected impacts from this new gear type and there is as yet no time series to assess any trends. Therefore it cannot be stated that the fishery is highly unlikely to disrupt the key elements underlying the ecosystem. SG80 is partially met. SG80 is not fully met and a score of 70 is given.
References		Landings Obligation Council Regulation (EU) 2015/104; Heath (2005); ICES 2007; Heslenfeld & Enserink (2008): Pinnegar & Blanchard (2008); Hutton *et al.* (2008); Pinnegar et al. (2010); Calloway et al. (2007); Mackinson and Daskalov, 2007; Mackinson 2001; Sction 3.4.4 of the main report;
OVERALL PERFORMANCE INDICATOR SCORE:		**70**
CONDITION NUMBER (if relevant):		**8**

Evaluation Table for PI 2.5.2

PI 2.5.2		**There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Y	Y	N
	Justification	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. Sustainable management of fisheries within the waters of the European Union are facilitated and effected under the framework of the Common Fisheries Policy. For the future, the CFP recognises the need to manage fisheries collectively on a multispecies basis as well as recognising the need to increasingly take into account ecosystem aspects and influences in formulating future fishery management policy and in developing management plans. Significant advances are being made at scientific level principally through ICES e.g. Working Group on Multispecies Assessment Methods (WGSAM), in order to support the development of multispecies assessment methodologies. The Netherland's commitment to the CFP supports future developments with respect to fisheries management at European level and forms the basis of a partial strategy that is increasingly expected to take into account and restrain ecosystem impacts of the fishery in the future. While implementation of a full ecosystem approach to fisheries management is still some way off and in depth scientific debate is taking place at an international level as to the best ways to implement such a policy (such as discussions on how best to implement the Landings Obligation aspect of the reformed CFP for demersal fisheries – at a practical level), some measures are in place in the interim to identify and avoid or reduce ecosystem impacts of the fishery where possible. A full suite of management measures apply to quota species at fleet level including vessel licensing, quota allocation and effort limitation; while a second tier of technical control measures adds to the partial strategy to manage ecosystem impacts of the fishery. In addition, the EU promotes research into reducing ecosystem impacts of fishing and has funded a number of important research projects designed to investigate fishing gear modifications in order to reduce ecosystem impacts (such as the RECOVERY and REDUCE projects). It is currently funding a Pilot Project to assess the wider effects of pulse trawling, including at ecosystem level (however, the details of this project were not finalised at the time of this assessment in early July 2015). Further provisions of European law designed to protect the marine environment and marine ecosystems, such as the Marine Strategy Framework Directive 2008/56/EC, in conjunction with the Habitats Directive (92/43/EEC) are playing an important role in limiting fishery related ecosystem impacts. The Marine Strategy Framework also aims to establish a network of Marine Protected Areas by 2020. SG80 is met. SG100 is not met, as the Pilot project, which could be considered a strategy, to study the ecosystem effects of pulse trawl gear has not yet been implemented.		

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
b	Guidepost	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy 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 strategy, which consists of a plan, contains 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.
	Met?	Y	Y	N
	Justification	Measures are in place to identify and avoid or reduce ecosystem impacts of the fishery where possible (through e-logs, ETP logs, VMS). A full suite of management measures apply to quota species at fleet level including vessel licensing, quota allocation and effort limitation, as well as technical control measures on gears and vessels. SG60 is met The partial strategy outlined under a) takes account of the benthic ecosystem in terms of trawling per se, but not specifically the use of pulse gear. There is some comparative information between pulse and non-pulse trawl gear (Rasenberg 2014; van Maarlen 2011, Soetaert, 2015) that indicate impacts are comparatively reduced. Most available information is based on experimental results. These have informed measures within the fishery to, for example limit field strength, as well as existing fishery management measures (e.g. licensing and days at sea) that limit the impact of the fishery on the ecosystem. SG80 is met The research strategy is not yet in place, and this is intended to provide the information required to inform a management strategy that will address all main impacts. SG100 is not met, as the Pilot project, which could be considered a strategy, to study the ecosystem effects of pulse trawl gear has not yet been implemented.		
c	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.

PI 2.5.2		**There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function**		
	Met?	Y	Y	N
	Justification	The measures are considered likely to work based on plausible argument and theory modelling directly from the fishery/ecosystems involved, and a history of fishery management at EU level in the North Sea, thus indicating that the structure and function of the marine ecosystem is not irreversibly harmed. SG60 is met The partial strategy generally takes into account European environmental policy and also reflects current international scientific thinking. It is also intended to be both adaptive to change and reactive to marine ecosystem changes (see Marine Strategy Framework 2008/56/EC; Technical measures for TAC and gear restrictions, etc). Experimental results to date and the theory on the effects of electricity on marine organisms and physio-chemical properties suggest that, what currently amounts to a partial strategy, should work, i.e. limiting the pulse fishery to not pose a risk to ecosystem structure and function. SG80 is met SG100 is not met, as the Pilot project, which could be considered a strategy, to study the ecosystem effects of pulse trawl gear has not yet been implemented and it cannot be concluded that strategy will work in relation to this novel gear.		
d	**Guidepost**		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.
	Met?		N	N
	Justification	Although there is evidence to show that the measures, as part of a partial strategy, governing 'regular' demersal trawling activity are implemented successfully, technical measures to govern pulse trawl are currently still being worked out (interview with Control Union 30th June 2015; Ministry of Economic Affairs 30th June 2015). Pulse trawl gear is still being considered under general trawling, TBB, there is as yet no official distinction between pulse gear and demersal trawl gear, which affects refined data collection. The distinction between traditional beam and pulse trawl along with the introduction of the control protocol are expected to provide the evidence necessary to show the fishery-specific measures, such as field strength limits, are being implemented successfully. SG80 is not met.		
References		www.ices.dk/community/groups/Pages/WGSAM.aspx; Marine Strategy Framework Directive 2008/56/EC; Habitats Directive (92/43/EEC); Directive 2008/56/EC; Client information pack; ETP logs; landings data; observer data; Rasenberg 2014; van Marlen 2011; Mackinson etal (2007); interviews at site visit; IMARES 2015, Flatfish pulse fishing, research results and knowledge gaps. C091/15		
OVERALL PERFORMANCE INDICATOR SCORE:				**75**

PI 2.5.2	There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function
CONDITION NUMBER (if relevant):	**9**

Evaluation Table for PI 2.5.3

PI 2.5.3		**There is adequate knowledge of the impacts of the fishery on the ecosystem**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Y	Y	
	Justification	Information is adequate to broadly understand the key elements of the ecosystem. Key elements include the trophic structure of the North Sea ecosystem such as key prey, predators and competitors; community composition, productivity patterns and characteristics of biodiversity. Mackinson etal (2007) has provided a detailed analysis and modelling of the NS marine ecosystem (see also Section 3.4.4)		
b	**Guidepost**	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated in detail.
	Met?	Y	N	N
	Justification	The main impacts of this fishery on the ecosystem consist of fishery removal and physical impact on the benthos. Main interactions between the fishery and the ecosystem elements listed under a) can be inferred from existing information, and have been investigated for demersal trawl (see Mackinson etal 2007), as well as the detailed overview given in Section 3.4.4 of this report. Mackinson (2001) described the construction and calibration of an ecosystem model of the North Sea using the Ecopath with Ecosim approach. The Mackinson and Daskalov model (2007) has improved understanding of how the relationships among the fish community may have changed under changing levels of exploitation and changes in the abundance of fish stocks, and benthos interactions. However, those studies looked at the ecosystem impact of 'regular' demersal trawl gear, and not the impact of pulse gear on ecosystem elements. Some studies have been carried out since 2011 (as part of EU Derogations) on the effects of pulse on particular species within the ecosystem – these have been outlined in Section 3.4.4 and Section 3.4.3 of this report, as well as comparing discarding levels between 'regular' demersal trawl and pulse trawl. One main impact of this pulse gear is on the interface between the benthos and adjoining layers; i.e. the effects on seabed, substrate and water column and the potential of resulting dissolving toxic chemicals through pulse? This was identified as a gap in knowledge by IMARES (2015). Also, the effects of pulse fishing on early life stages of marine organisms that live in shallow water as well as mortality (directly and indirectly) and how does this feed into the greater foodweb? There are no in situ time series studies to infer impact of this pulse gear. SG80 is not met.		

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
c	Guidepost		The main functions of the Components (i.e., target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Y	N
	Justification	The main functions of the components (i.e. target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known. Section 3.1, 3.2, 3.3 and 3.4 of the main report outline the array of data that are collected in relation to the fishery. The range of data is sufficient to allow the main impacts on these components to be inferred directly. SG80 is met, but the impacts of the fishery on the main functions are not yet understood and SG100 is not met.		
d	Guidepost		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 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.
	Met?		N	N
	Justification	There is information available on the impact of demersal trawl fishing on these components. But as outlined under the individual components, there is little information available on how fishing with electric pulse impacts on these components, which may have consequences for the benthic ecosystem. Therefore the main consequences for the ecosystem cannot be inferred.. However, studies are currently being designed (see Pilot Project proposals under Derogation in 2014). SG80 is not met		
e	Guidepost		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).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		Y	N

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem
	Justification	Data is routinely collected on a regular basis to allow for the detection of any change or increase in risk level to the main ecosystem components. Key data collected include landings data for all species, discard data from observer trips and reports, spatial data in relation to fishing effort (via EU logbooks and VMS) and data in relation to fishing effort. The CVO is also now collecting detailed information on ETPs (an ETP-log has been in operation since March 2015 and is being rolled out across the fleet). Now that almost the whole Dutch demersal trawl fishery is using pulse, inferences can be made as to trend changes. However, this gear has still to be recognised at EU technical measures level. SG80 is met. With research ongoing and further work planned, the impacts of the fishery are not fully understood sufficiently to inform a strategy.
References		Mackinson etal (2007); Mackinson 2001; VMS; ETP logs; client information pack; site interviews; D*erogation from EU Council regulation 850/98 - Derogations 43-84: EU Council regulation 1380/13 (article 14);* Section 3.4.4 of main report; IMARES 2015 C091/15
OVERALL PERFORMANCE INDICATOR SCORE:		**75**
CONDITION NUMBER (if relevant):		**10**

Evaluation Table for PI 3.1.1

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Y	Y	Y
	Justification	The fishery operates in EU waters managed under Dutch, UK and other member states, which all implement EU fisheries regulations. The principle legislative instrument for fisheries management in the EU is the Common Fisheries Policy (CFP), which aims at achieving sustainable fisheries management across the EU. This clearly aims to achieve both P1 (stock management) and possibly to a lesser extent P2 (wider ecosystem impacts). For example, the regulation states: "The Common Fisheries Policy should ensure that fishing and aquaculture activities contribute to long-term environmental, economic, and social sustainability." (EC, 2013) The CFP is enacted into Dutch law (and the other member states where fishing occurs), directly reflecting the scope and objective of the CFP and as such aim at achieving sustainable fisheries in accordance to MSC P1 and P2. Underneath the umbrella of the CFP, there are many binding EC regulations covering all aspects of fisheries, which are amended and updated as required. For example, some of the key recent pieces of legislation include the Technical Regulation, Control Regulation and requirement for Registration of Buyers. There are also binding EU procedures governing cooperation in relation to P2 e.g. the Birds & Habitats Directive and the Marine Strategy Framework Directive. Recent infraction proceedings taken by the Commission against several Member States demonstrate that at EU level the mechanism can be *'considered effective'.* The EU shares North Sea waters with Norway. There has been a bilateral agreement between the EU and Norway on fisheries matters since 1981 (EC Reg 2214/80), which is extended every six years with a 9 month termination period that has not been invoked to date. The framework agreement includes: Article 2 1. Each Party shall, as appropriate, determine annually for its area of fisheries jurisdiction, subject to adjustment when necessary to meet unforeseen circumstances, and on the basis of the need for rational management of the living resources: (a) the total allowable catch for individual stocks or complexes of stocks, taking into account the best scientific evidence available to it, the interdependence		

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
		of stocks, the work of appropriate international organizations and other relevant factors; The annual allocation of plaice quota has been agreed with Norway on an ongoing basis and this is a binding procedure (SG100 is met).		
b	**Guide post**	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	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 incorporates or 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.
	Met?	Y	Y	N
	Justification	Following the review of the CFP in 2002, increased emphasis was placed on stakeholder engagement in the management process as a means of proactively avoiding disputes. Regional Advisory Councils (RAC) were created, including one for the North Sea that has a number of specific Working Groups, with active representation of both fishermen and environmental NGOs, and participation of regulators and managers with observer status. The main mechanisms for the resolution of legal disputes is the Dutch judicial system. In the event of a fisheries infringement, the relevant Member State control agencies enforce the above EC regulations and apply appropriate sanctions. NVWA passes infringement details to the public prosecutor who will then decide the value of the fine. Fishermen, or industry representatives can appeal to the full judicial process. Within the EU waters where the fishery operates and/or where fish is landed, the system is proven to be ***effective'.*** *Within the North Sea, the fishery is shared between the EU and Norway. Article 8 of the bilateral agreement states:* The Parties agree to consult on questions relating to the implementation and proper functioning of this Agreement, or in the event of a dispute concerning the interpretation or application thereof. *D*ifficulties have been found in achieving agreement on TACs for specific stocks in isolated years. For example, there was a failure to agree the 2010 plaice quota with Norway. This showed that the system is effective in dealing with most issues (SG80 is met), but was not proven to be effective when tested and *SG100 is not met.*		
d	**Guide post**	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or	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	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
		livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	with the objectives of MSC Principles 1 and 2.	
	Met?	Y	Y	Y
	Justification	The EU CFP sets out a formal commitment to observe the legal and customary rights of people dependent on fishing, through its objectives and a commitment to relative stability (meaning Member States are consistently allocated the same proportion of particular stocks): "In view of the precarious economic state of the fishing industry and the dependence of certain coastal communities on fishing, it is necessary to ensure relative stability of fishing activities by the allocation of fishing opportunities among the Member States, based upon a predictable share of the stocks for each Member State." Objectives of the CFP include: (f) contribute to a fair standard of living for those who depend on fishing activities, bearing in mind coastal fisheries and socio-economic aspects; (i) promote coastal fishing activities, taking into account socio- economic aspects; UoC vessels are registered in the Netherlands and fish in EU waters. The management system is therefore subject to the CFP, which does 'formally commit' to fisheries-dependent communities and therefore SG 100 is met.		
References		EC Regulation 1380/2013 on the Common Fisheries Policy EC Regulation 2214/80 of 27 June 1980 on the conclusion of the Agreement on fisheries between the European Economic Community and the Kingdom of Norway EC Regulation 2015/104 fixing for 2015 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union vessels, in certain non-Union waters, amending Regulation (EU) No 43/2014 and repealing Regulation (EU) No 779/2014		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.2

PI 3.1.2		**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**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	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.	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.
	Met?	Y	Y	Y
	Justification	Section 3.5 of this assessment report provides a description of the key roles and responsibility in the fishery management process. Organisations and their roles are well defined at both an EU level, through, for example, participation in the NSAC, and at national and local levels via Ministry of Economic Affairs and similar, including: » Management / administration: EU DG Mare, Ministry of Economic Affairs » Scientific Advice: ICES, EU's STECF & ACOM, Imares. » Control & Enforcement: EU Community Fisheries Control Agency (CFCA), NVWA » Industry Representation: CVO, Dutch POs, VisNED. The N. Sea region also has strong NGO representation, which, over recent years have played an important role in encouraging a more ecosystem-based approach to fisheries management.		
b	**Guide post**	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	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 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.
	Met?	Y	Y	N
	Justification	The main regular consultation process is via the North Sea Advisory Council which involves Industry / NGO / Scientific participants. This includes the potential for local knowledge to be included. All changes in policy such as CFP reform requires extensive consultation processes		

PI 3.1.2		**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**		
		by DG Mare of the European Commission, consulting with all EU and national level representatives. SG80 is met. Although the management system regularly seeks and accepts relevant information, there is no evidence that explanations are offered for how it is used or not used in all circumstances so 100 not met		
c	**Guide post**		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?		Y	Y
	Justification	There is extensive involvement of all interested and affected parties in regular consultation and EC consultation is an open, public process. In the North Sea effective engagement is facilitated through the NSAC including the active involvement of Environmental NGOs, along with consultation exercises. The EC must develop and consult on policies and regulations based on the Better regulation guidelines (SWD (2015) 211), which sets out the EC requirements for effective consultation processes. The reform of the CFP with a greater emphasis on regionalization and sea basin-level management (enhancing the role of the NSAC), along with the development of the Better Regulation Guidelines ensures more effective consultation and is a recent improvement in performance that meets SG100, which was not the case in some earlier assessments. A higher score of 95 overall is therefore justified compared to previous assessments scoring at 90.		
References		• http://www.nsrac.org • http://ec.europa.eu/dgs/maritimeaffairsfisheries/consultations/indexen.htm • EC SWD (2015)		
OVERALL PERFORMANCE INDICATOR SCORE:				**95**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.3

PI 3.1.3		**The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	Long-term objectives to guide decision-making, consistent with the MSC Principles and Criteria and the precautionary approach, are implicit within management policy	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.
	Met?	Y	Y	Y
	Justification	The CFP contains clear long-term objectives that guide decision-making and are consistent with MSC principles. These are presented in section 3.5 of the report. The CFP is explicit in requiring the precautionary approach to guide all management policy, including the national management of vessels in the UoC and the Long Term Management Plan for plaice and sole in the North Sea that governs the fishery. SG100 is therefore met.		
References		REGULATION (EU) No 1380/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC		
OVERALL PERFORMANCE INDICATOR SCORE:				**100**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.4

PI 3.1.4		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guide post**	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.
	Met?	Y	Y	partial
	Justification	The reform of the CFP has moved away from the often-critcised centralized and complex suite of management measures that began to characterize European fisheries. Instead the reformed CFP (1380/2013) has increased regionalisation and encourages results-based management are intended to enable locally-specific measures and incentives to achieve desired outcomes. One example where this new approach has been developed is the introduction of the Landing Obligation (discard ban). The specifics of the landing obligation are still being determined (as the EC has stated the expected result, not the exact method of achieving this), but details have been developed regionally. For the North Sea the Scheveningen group has proposed a regional discard plan outlining how North Sea member states, including the Netherlands, will interpret the regulation. The need to avoid by-catch that would prevent a fishery from operating incentivizes increased selectivity and spatial/temporal management to avoid by-catch. This, along with additional effort for fisheries showing low cod by-catch levels, demonstrate that the management system provides incentives that are consistent with P1 and P2 (the first part of SG80 is met). In some existing North Sea Plaice fisheries that are MSC certified, conditions exist in relation to a perverse incentive resulting from the effort management regime under the cod recovery plan: the use of smaller mesh nets ensures more days at sea are available than for larger mesh nets that are assumed to target cod. This is no longer reported by stakeholders as an issue as days at sea have not limited North Sea activity (quota limits the fishery first). Vessels potentially impacted by the regulation have shown that their cod by-catch is sufficiently low to warrant additional days at sea being allocated (a positive incentive). As such the second part of SG80 is met as the management system has sought to ensure perverse incentives do not arise. The reform of the CFP did give some consideration to incentives and this is reflected in the Landing Obligation and the introduction of the European Maritime and Fisheries Fund (EMFF) where funding is available to innovate (new technical and organizational knowledge), for increased gear selectivity (on size and species), to reduce incidental/accidental by-catches. Vessel owners and fishermen working on board vessels also receive financial support for participating in trials and pilot projects and for collaborating with scientists. POs also receive funding to help implement the discard ban, for better labelling of products and for the marketing of new products. Incentives can also take the form of quota allocation. Member States are free to allocate their national quotas to different vessel segments, giving for example more		

PI 3.1.4		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing
		quotas to vessels that fish more environmentally friendly. This has occurred with the allocation of effort, but not with quota allocation. It is also evident from the measures still included under the EMFF that Member States have retained some subsidies that may not be effective in incentivising sustainable practice. As such the reformed CFP provides evidence of incentives being considered and some progress towards the expectations under SG100 and a partial score of 90 is given.
References		Common Fisheries Policy Regulation (EU) no. 1380/2013 (the "Basic Regulation") North Sea Demersal Discard Plan: http://www.nsrac.org/category/keydocs/approved-plans/ MMO days at sea in cod recovery zone: https://www.gov.uk/government/publications/manage-your-fishing-effort-cod-recovery-zone
OVERALL PERFORMANCE INDICATOR SCORE:		**90**
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.2.1

PI 3.2.1		**The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.	Well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.
	Met?	Y	Y	Partial
	Justification	CR V1.3 states: "The objectives shall be assessed under this PI and the strategies that implement the objectives shall be assessed under P1 and P2." The fishery-specific management system is based on the multi-annual plan for plaice and sole in the North Sea (EC Reg. 676/2007). "1. The objective of the plan is to ensure, in a first stage, that stocks of plaice and sole in the North Sea are brought within safe biological limits, and in a second stage and after due consideration by the Council on the implementing methods for doing so that those stocks, are exploited on the basis of maximum sustainable yield and under sustainable economic, environmental and social conditions. " Exploitation at MSY is the explicit objective of the plan with well-defined and measurable short and long term objectives. It therefore achieves SG100 in relation to Principle 1 objectives. In relation to Principle 2 objectives, the plan states that in line with the CFP, an ecosystem approach should be adopted that, inter alia, seeks to reduce to a minimum the impact of fishing on marine ecosystems. This is consistent with MSC P2 principles and explicitly stated and so SG80 is met. Specifically for the plaice fishery it recognizes the contribution that the sole fishery makes to fishing mortality and that the sole fishery must therefore be a consideration in management of plaice: "6. Consequently, in drawing up the multiannual plan, account should also be taken of the fact that the high fishing mortality rate for plaice is due to a great extent to the large discards from beam-trawl sole fishing with 80mm nets in the southern North Sea. " Well-defined and manageable objectives are explicit in relation to the sole & plaice fishery and this will be more closely addressed under the full implementation of the landing obligation. However other ecosystem objectives are less well defined and measurable and SG100 is not met in relation to P2 objectives. A partial score of 90 is therefore given.		
References		COUNCIL REGULATION (EC) No 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Amended by: Council Regulation (EC) No 1224/2009 of 20 November 2009		
OVERALL PERFORMANCE INDICATOR SCORE:				**90**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.2

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Y	Y	
	Justification	Section 3.5 of this report details the various parties involved in decision-making. In summary, each year, data is collected from member state fleets and surveys by Member State management authorities; ICES advice is produced (then reviewed by STECF) for consideration by the EC. The EC then proposes fishing opportunities that must be agreed by the European Parliament and the Council of Ministers before the TAC for the following year is set. Decision-making is well established in order to deliver the fishery-specific objectives. SG 80 is met.		
b	**Guidepost**	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.	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 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.
	Met?	Y	N	N

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**		
	Justification	The annual revision of TAC shows how management can respond to any serious issues that emerge. Research and monitoring is commissioned by or shared with decision-making bodies to enable them to respond appropriately. Each member state has the authority to close the fishery in its waters in response to important issues such as by-catch or habitat impact that are identified through research and monitoring. This has not occurred to date and discussions continue over the management of vulnerable in marine SACs through the restriction of certain fishing gears. Emerging issues are raised (e.g. through NSAC) and considered against the wider implication of management action such as socio-economic impact or displacement of effort into other fisheries. The decision-making processes do not, however, always respond in a timely and adaptive manner. There are examples of this at the LTMP level and within national management of the fishery. The EU was slow to move to stage 2 of the LTMP (management rather than recovery) despite plaice and sole being within safe biological limits for 3 years prior to the decision at the end of 2014. The response of the Dutch management authorities to other issues emerging in the fishery, such as the introduction of the pulse technique are also not timely. Despite the great majority of the Dutch beamer fleet having now moved to pulse, no control protocol is in yet in. This indicates responses by decision-making processes are not always timely and adaptive and so SG80 is not met.		
c	**Guidepost**		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		N	
	Justification	In line with the CFP the multi-annual plan for plaice and sole states that: “the Community is to apply the precautionary approach in taking measures to protect and conserve the stock, to provide for its sustainable exploitation and to reduce to a minimum the impact of fishing on marine ecosystems.” The multi-annual plan has been evaluated by STECF and the ICES assessment benchmarked; both consider the multiannual plan and the annual assessment to be precautionary and SG80 is met with regard to the LTMP. However the precautionary approach is not always evident across the fishery management system. Justification for the expansion of the pulse derogation is based on Article 14 of the CFP basic regulation (1380/2013), which requires pilot studies to be based on the best available scientific advice. Therefore while this aspect of the SG80 is met, it cannot be considered precautionary to increase the number of pulse derogation licences to such an extent. In this regard SG80 is not met.		

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**		
d	**Guidepost**	Some information on fishery performance and management action is generally available on request to stakeholders.	Information on fishery performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on fishery performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Y	Y	N
	Justification	The North Sea is perhaps the most intensively studied and monitored sea area in the world. All member state vessels must report daily landings of quota species through e-logbooks. Additional information on fleet capacity, effort and economic performance in the fishery is collected as a requirement of the Data Collection Framework applied in each member state. These data are collated by the Joint Research Council (JRC) and used by ICES and STECF working groups in formulating advice on the fishery and the fleets targeting it. This information is available from the relevant working group websites: Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak: http://www.ices.dk/community/groups/Pages/WGNSSK.aspx STECF final reports: https://stecf.jrc.ec.europa.eu/reports The above reports explain how the information has been analysed and interpreted in the formulation of advice. All decisions related to the fishery such as annual TACs and days at sea are published by the Commission. These, along with Member State specific decisions, are communicated by the Dutch authorities to the fishing sector either directly to quota holders or via Producer Organisations. Management authorities have improved their reporting of decisions and how those decisions have been reached. SG80 is met. This does not, however, extend to formal reporting to all stakeholders and may not be considered comprehensive in relation to management actions and their response to research, monitoring and evaluation. SG 100 is not met.		
e	**Guidepost**	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 or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**		
	Met?	Y	Y	Y
	Justification	The fishery is not showing a disrespect or defiance of the law by repeatedly violating the same law or regulation. Industry and management authorities in both the UK and the Netherlands that are associated with the plaice North Sea plaice fishery do attempt to comply in a timely fashion with judicial decisions. This is evidenced by the control agencies commitments to prosecutions and legal challenges as well as Managing Authority responses to European decisions on quota management (overshoots, roll over, etc.) and the implementation of real time closures (SG80 is met). In the Netherlands, the management system shows pro-active avoidance through the system of co-management that has been established. Extensive consultation with stakeholders prior to implementing new regulation and regular meetings between industry representatives and managers also seeks to avoid disputes arising. SG100 is met Three of the five SG80 scores are met resulting in an overall score of 75.		
References		COUNCIL REGULATION (EC) No 676/2007 of 11 June 2007 establishing a multiannual plan for fisheries exploiting stocks of plaice and sole in the North Sea. Amended by: Council Regulation (EC) No 1224/2009 of 20 November 2009 Netherlands Ministry of Economic Affairs: implementation of quotas and real time closures. http://www.government.nl/issues/fisheries/fishing-quotas-and-temporary-closure-of-fishing-areas		
OVERALL PERFORMANCE INDICATOR SCORE:				**75**
CONDITION NUMBER (if relevant):				**11**

Evaluation Table for PI 3.2.3

PI 3.2.3		**Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Y	N	N
	Justification	MCS in the North Sea plaice and sole fisheries (as stated in the EC implementing regulation 404/2011 and the specific control and inspection programme EC reg 2013/328/EU) is a combination of technical measures such as the requirement for Vessel Monitoring Systems (VMS) on vessels over 12m (all UoC vessels) and e-logbooks. This is supported by at sea inspection, aerial surveillance and port inspection. There is also corroboration of logbook data with sales notes. EC Reg 2013/328: The specific control and inspection programme should be established for the period until 31 December 2018 and should be implemented by Belgium, Denmark, Germany, Ireland, France, the Netherlands, Sweden, and the United Kingdom. This is co-ordinated by the European Fisheries Control Authority (EFCA). Control authorities have a reasonable expectation and confidence that MCS measures in the North Sea plaice and sole fisheries are effective. The resources available to and used by those authorities have demonstrated an ability to enforce the regulations applying to the fishery. The NVWA manages monitoring control and surveillance of Netherlands vessels in Dutch waters. Various MCS tools related to the sole and plaice fishery is evident and there is reasonable expectation it is effective. The development of the pulse fishing technique has brought with it new challenges for the control authorities. In addition to the physical characteristics of the gear, some control on the electrical characteristics of the gear determining field strength is required. NVWA remain in discussion with gear developers to produce an appropriate control protocol to cover both pulse gear systems. As such no official control protocol to check the pulse gear is in place. In the interim the CVO has introduced its own control system and has brought in independent expertise to measure the gear and check compliance. There is therefore a reasonable expectation that these mechanisms are effective (SG60 is met). However the integration of these measures into the wider MCS system is still to occur and SG80 is not met.		
b	**Guidepost**	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.

PI 3.2.3		**Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with**		
	Met?	Y	N	N
	Justification	Control sanctions consist of verbal and written warnings, fines and ultimately prosecution with the revocation of fishing licence a possibility. These were described by NVWA and examples of these being applied were provided (SG60 is met). It has also been stated that a €5,000 fine that has been applied in several instances is not an effective deterrence in these high value fisheries. As a result there have been instances of small sole being caught and landed within the pulse trawl fishery. This suggests that the sanctions do not create an effective deterrent (SG80 is not met).		
c	**Guidepost**	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Y	Y	N
	Justification	NVWA and CVO (citing their own control reports) provided some evidence demonstrating compliance with the management system (SG80 is met). A letter to the NSAC focus group on pulse fishing from the Ministry of Economic Affairs explains that there are some checks in place with regard to the pulse gear: A technical file (TF) must be kept on board during every fishing expedition. This TF must have been prepared by the supplier of the pulse fishing gear that was supplied to you and installed on your vessel, and this TF must contain a declaration from the supplier that the pulse fishing gear complies with the abovementioned requirements. The TF is part of the inspection of the pulse fishing gear. The Human Environment and Transport Inspectorate also requires a TF to be kept on board for fishing with a pulse trawl. The TF forms part of the regular certification of your vessel by the Human Environment and Transport Inspectorate. With the reports of infringements and the lack of an official, fully implemented control protocol, there cannot be a high degree of confidence of compliance (SG100 is not met).		
d	**Guidepost**		There is no evidence of systematic non-compliance.	
	Met?		Y	

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with
	Justification	An NVWA report on CVO vessels provided to the assessment team illustrates that there is no evidence of systematic non-compliance. SG80 is met.
References		NVWA pers. comm Min of Economic Affairs letter to NSAC Pulse Fishing Focus group (25/02/15) EC Control Regulation: Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy COMMISSION IMPLEMENTING REGULATION (EU) No 404/2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy COMMISSION IMPLEMENTING DECISION of 25 June 2013 establishing a specific control and inspection programme for fisheries exploiting cod, plaice and sole in the Kattegat, the North Sea, the Skagerrak, the eastern Channel, the waters west of Scotland and the Irish Sea
OVERALL PERFORMANCE INDICATOR SCORE:		**70***
CONDITION NUMBER (if relevant):		**12**

Harmonisation: Other certified plaice and sole fisheries (using twin-rig trawl) are scored without a condition. This difference is due to the specific circumstances identified in the pulse trawl fishery.

Evaluation Table for PI 3.2.4

PI 3.2.4		**The fishery has a research plan that addresses the information needs of management**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.
	Met?	Y	Y	N
	Justification	Research co-ordinated by the ICES Working Group informs the management system in respect to P1 and some P2 matters. Together this can be considered a research plan that helps to achieve P1 and P2 objectives, meeting SG80. Further research work is undertaken by IMARES and economic institutions such as Wageningen University as plaice and sole are key fisheries for the Dutch demersal fleet. This research extends to some P3 matters, but a comprehensive research plan is not evident and SG100 is not met.		
b	**Guidepost**	Research results are available to interested parties.	Research results are disseminated to all interested parties in a timely fashion.	Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
	Met?	Y	Y	N
	Justification	There is dissemination of information from ICES, and national science providers such as IMARES, Cefas and ILVO in Belgium as well as EC-funded studies involving international collaboration (SG80 is met). A pre-requisite of European funding is the pilot programme and that this includes dissemination of results. These and ICES research are publicly available, but it is not evident that all the material from other institutions is made publicly available so 100 not met		
References		» Proceedings of the first International Seminar on pulse trawling, July 2015 » MoEA, 2014 Pilot project for pulse fishing and the landing obligation: programme description.		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.5

PI 3.2.5		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives** **There is effective and timely review of the fishery-specific management system**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery has in place mechanisms to evaluate some parts of the management system.	The fishery has in place mechanisms to evaluate key parts of the management system	The fishery has in place mechanisms to evaluate all parts of the management system.
	Met?	Y	Y	N
	Justification	The MAMP for flatfish in the North Sea is evaluated on an annual basis in recognised processes. NVWA reports that the control protocol under development would be subject to MoEA evaluation processes. The management of the pulse fishery is on the basis of licence conditions derived from an EU derogation. These are temporary derogations and MoEA has stated that these will be subject to evaluation during the derogation and at the end of the 5-year licence period. SG80 is therefore met in relation to key parts of the management system. It is not evident that all parts of the management system are to be evaluated and SG100 is not met.		
b	**Guidepost**	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	Y	(Y)	(N)
	Justification	STECF is established under EC Reg 2016/ 74/05) to provide advice to the EC and reports in response to DG MARE requests, which may be considered 'occasional external review'. The MoEA reviews NVWA performance, which may be considered external review. The evaluation of the MoEA pilot project will be subject to external review. As this represents an ad-hoc research programme, SG80 reuirements for occasional external review are identified, but regular external review is not and so SG100 is not met.		
References		MoEA, 2014 Pilot project for pulse fishing and the landing obligation: programme description. Commission Decision of 25 February 2016 setting up a Scientific, Technical and Economic Committee for Fisheries (2016/C 74/05)		
OVERALL PERFORMANCE INDICATOR SCORE:				**80**
CONDITION NUMBER (if relevant):				

Appendix 1.2 Risk Based Framework (RBF) Outputs

RBF was not used for this assessment

Appendix 1.3 Conditions

There are 12 instances where SG80 was not achieved for a PI in this assessment. As the fishery did not achieve a score of 80 overall for P2, the fishery fails and therefore there is no formal requirement to progress conditions of certification. The following outline conditions are therefore provided to summarise which scoring guideposts did not achieve the SG80 standard and what may be required to achieve an 80 score.

Condition 1 – plaice UoC

1.1.2 Reference Points: Limit and target reference points are appropriate for the stock.

The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome (SG80c)

Under the second stage of the Multiannual Management Plan (MAMP), the aim is the exploitation of plaice on the basis of maximum sustainable yield. The MAMP defines F_{MSY} as a rate equal to or no lower than 0.3. Subsequently ICES carried out an evaluation of MSY for plaice and concluded that fishing within the range F_{catch} 0.25 – 0.3 would be consistent with MSY (ICES 2012; WKFRAME, 2011). Since the range encompassed the MAMP target reference point of 0.3, this was considered to meet the requirements of SG c. However, a further evaluation of MSY has now established that the median point for Fmsy is 0.19 and the likely range is from 0.13 to 0.27 (WKMSYREF-3, 2014). The new range is outside the MAMP target of 0.3 and so the target reference point no longer satisfies the requirements of SG c at 80.

The following (harmonised) condition is proposed: By the third annual surveillance audit, the following SG80 SIs must be met: The target reference point (F_{MP}) is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.

Condition 2a and 2b: plaice and sole UoC

1.2.2. Harvest Control Rules: There are well-defined and effective harvest control rules in place

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 (SG 80a).

The harvest control rules are set out under the Multiannual Management Plan for flatfish (EC 676/2007) and are fully consistent with the Harvest Strategy. The main mechanisms to contain the harvest of North Sea plaice are capacity restrictions and the setting of an annual TAC under agreement between the EU and Norway. Under the first stage of the MAMP, the TAC is determined by selecting a fishing mortality that will ensure the spawning stock biomass will remain above precautionary levels. If the spawning stock biomass is outside the precautionary reference level Bpa of 230,000t, fishing mortality is required to be reduced annually by 10% (within a maximum annual variation in TAC of 15%). Under the second stage, the exploitation rate is reduced on an annual basis if the fishing mortality exceeds the management target of 0.3. Although these rules are designed to ensure that the SSB does not approach limit reference points, the MAMP does not specifically define how the exploitation rate would be reduced if the limit reference points were approached. As a result, the SG at 80 is not met.

The following (harmonised) condition is proposed: By the third annual surveillance audit, the following SG80 SI must be met: 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.

Condition 3 – all UoCs

PI 2.3.1 a 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.

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

The pulse fishery has been operating in the North Sea at a significant scale for around 5 years, only growing to 84 vessels in operation since 2014. The impacts of pulse fishing on ETP species cannot be determined through experience and has not been studied over a sufficiently long period to be confident that the impacts are highly likely to be within acceptable limits. This is particularly the case for benthic ETP species, including some elasmobranch species. The pilot project proposed as part of the additional derogation should address these specific concerns, recognising that the limited abundance of some species poses a challenge to the in-situ studies required.

Condition 4 - all UoCs

PI 2.3.3 b) *Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species:*

Considering that still little is known about the indirect effects of pulse trawling e.g. on the benthos on which these demersal ETPs depend on for feeding, for example, one cannot state that there is sufficient information to determine whether the fishery may be a threat to protection and recovery of the ETP species.

Condition 5- all UoCs

PI 2.4.1 a) *The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.*

Models and studies refer to demersal trawls; not including pulse. While the physical impact of pulse is less than beam, additional impacts of electricity are not fully understood. In situ studies available so far do not cover the effect of pulse on epifaunal and infaunal invertebrates. Analysis of fishing footprint does not cover a sufficiently long time series (only partial 2014 data was available at the time) to say that this fishery is highly unlikely to cause irreversible harm to habitat function (whereby the soft bottom seabed is a habitat for benthic and epibenthic species – see also CRv1.3 GCB3.14.1).

Condition 6- all UoCs

PI 2.4.*2 c) There is some evidence that the partial strategy is being implemented successfully*

Management plans in relation to natura sites and management of pulse fleet specifically are still to be implemented. At this time evidence that the partial strategy is being implemented is still lacking.

Condition 7- all UoCs

PI 2.4.3b) *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 of interaction, and the timing and location of use of the fishing gear.*

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 of interaction, and the timing and location of use of the fishing gear.

Condition 8- all UoCs

PI 2.5.1a) *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.*

There are an increasing number of studies on benthic species populations in time and space, which might make it possible to build on when studying the effects of electric pulse trawl on the benthos. Further research on direct and indirect impacts are identified by Quirijns et al (2015). These studies are not underway yet (see Section 3.4), and there is no time series of data to assess any trends. These information gaps should be addressed through research and, combined with ongoing monitoring of pulse fishing activity, would provide the necessary certainty in relation to ecosystem impacts.

Condition 9- all UoCs

PI 2.5.2 d) *There is some evidence that the measures comprising the partial strategy are being implemented successfully.*

Although there is evidence to show that the measures, as part of a partial strategy, governing 'regular' demersal trawling activity are implemented successfully, technical measures to govern pulse trawl are currently still being worked out (interview with Control Union 30th June 2015; Ministry of Economic Affairs 30th June 2015). Pulse trawl gear is still being considered under general trawling, TBB, there is as yet no official distinction between pulse gear and demersal trawl gear, which affects refined data collection.

The distinction between traditional beam and pulse trawl along with the introduction of the control protocol are expected to provide the evidence necessary to show the fishery-specific measures, such as field strength limits, are being implemented successfully.

Condition 10- all UoCs

PI 2.5.3b) *Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail*

Existing studies looked at the ecosystem impact of 'regular' demersal trawl gear, and not the impact of pulse gear on ecosystem elements. Some studies have been carried out since 2011 (as part of EU Derogations) on the effects of pulse on particular species within the ecosystem. However, as highlighted by Quirijns et al (2015) a number of topics warrant further investigation, and as yet there are no in situ time series studies to infer impact of this pulse gear. Such research should be completed to understand the main impacts of the fishery on the various ecosystem components.

d) *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.*

There is plenty of information available on the impact of demersal trawl fishing on these Components. But as outlined under the individual Components, there is little information available on how fishing with electric pulse impacts on the benthic habitat, which has consequences for benthos dwelling ETPs. Therefore the main consequences for the ecosystem cannot be inferred yet. However, studies are currently being designed (see Pilot Project proposals under Derogation in 2014). These studies should be completed and the results independently peer reviewed before implementing any necessary management measures identified to ensure any ecosystem impacts are addressed.

Condition 11- all UoCs

3.2.2b 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.

The response of the Dutch management authorities to other issues emerging in the fishery, such as the introduction of the pulse technique are also not timely. Despite the great majority of the Dutch beamer fleet having now moved to pulse, no control protocol is in yet in. This indicates responses by decision-making processes are not always timely and adaptive and so SG80 is not met.

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

The precautionary approach is not always evident across the fishery management system. Justification for the expansion of the pulse derogation is based on Article 14 of the CFP basic regulation (1380/2013), which requires pilot studies to be based on the best available scientific advice. Therefore while this aspect of the SG80 is met, it cannot be considered precautionary to increase the number of pulse derogation licences to such an extent and therefore SG80 is not met.

Condition 12- all UoCs

3.2.3 (a) A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.

The development of the pulse fishing technique has brought with it new challenges for the control authorities. In addition to the physical characteristics of the gear, some control on the electrical characteristics of the gear determining field strength is required. NVWA remain in discussion with gear developers to produce an appropriate control protocol to cover both pulse gear systems. As such no official control protocol to check the pulse gear is in place.

In the interim the CVO has introduced its own control system and has brought in independent expertise to measure the gear and check compliance. There is therefore a reasonable expectation that these mechanisms are effective (SG60 is met). However the integration of these measures into the wider MCS system is still to occur and SG80 is not met.

3.2.3 (b) Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.

Control sanctions consist of verbal and written warnings, fines and ultimately prosecution with the revocation of fishing licence a possibility. These were described by NVWA and examples of these being applied were provided (SG60 is met).

It has also been stated that a €5,000 fine that has been applied in several instances is not an effective deterrence in these high value fisheries. As a result there have been instances of small sole being caught and landed.

Industry stakeholders have also questioned the consistency in how measures are enforced between different control agencies across the North Sea control authorities (SG80 is not met).

It is expected that with the introduction and demonstration of the efficacy of the official control protocol that SG80 would be achieved.

Appendix 2. Peer Review Reports

PR 1

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**Conformity Assessment Body Response**
Justification: The assessment team arrived at an overall appropriate conclusion in its assessment (P2 does not pass, failing the overall assessment). Notwithstanding this, there are issues with individual PI scores that require addressing and would further support the assessment. *Principle 1:* The PI scores for plaice are generally appropriate and well supported although some changes are indicated. There are concerns on some of the sole scores. For PI 1.1.1, given that F has never been below F_{MP}, it is difficult to state that SSB is currently at target biomass, indicating a score of 75, requiring scoring of PI 1.1.3. PI 1.2.1 scores 95 although, as with plaice, SIa should not score, indicating a more appropriate score of 85. Similarly, PI 1.2.2 should score 75, not 95, for similar reasons as plaice scored 75. For PI 1.2.3, it is not clear why sole scored 80, while plaice scored 90, given the similarity of the information available. *Principle 2:* Plaice or sole are main retained species, dependent on which species is considered in P1, indicating additional scoring rationale in some PIs.		*Thank you for the review.* *The Assessment Team (AT) will address specific issues below.* We disagree about the PI 1.1.1 of sole, Sib at SG 80 is met in terms of F which is at or close to the LTMP reference level and within the range for Fmsy. In terms of the biomass reference level, there are uncertainties about the precise level of Bmsy but it is considered to be in the region above MSY Btrigger. The SSB has been above MSY Btrigger in 2012 and 2013 and is expected to remain at a similar level under the LTMP in 2014-15. Taken together these indicators suggest that the current position of the stock satisfies the second guideline at SG80. We have addressed the issue of better conformity between sole and plaice PIs This is true and explained under 2.1.1. Cross-references referring to each species under P1 are provided.

For PI 2.1.2, ICES has raised issues with the combined dab/flounder TAC which indicates a lower score for this species element and PI. For PI 2.3.3, the score (75) is incorrectly calculated and should be 65. For PI 2.5.3, based upon the gear designation issue, a lower score of 75 is indicated. Further rationale and justification for some of the scores (e.g. PI 2.1.1, 2.4.2, 2.4.3) and in other cases (e.g. PI 2.1.3, 2.2.2, 2.2), additional text would clarify the scores. *Principle 3:* Few changes are indicated to the PIs except for PI 3.1.1, where a lower score of 85 may be more appropriate. Also, the role of STECF has recently changed which affects the text in some of the PIs (PI 3.1.2, 3.2.2, 3.2.5). Further, there are significant differences in some PIs (e.g. 3.2.3) with the scores in other assessments (Osprey and FROMM). These should be checked and if needed, commented on the harmonization section.	*Noted and text amended, but this does not warrant a revised score.* Although ICES has raised issues with the combined dab/flounder TAC, current information about the dab in the North Sea indicates that the stock is within biologically based limits. *See responses to specific PIs below.* *Noted re. STECF and text added, including re. harmonisation .* *We will review these specific issues and respond below.*

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes**	**Conformity Assessment Body Response**
Justification: It is recognized that, given that P2 did not achieve an overall score of 80, the conditions are only in outline. It would have evaluation of these outline conditions if they had been formatted as per MSC guidelines (i.e. include condition statement and timeline). Notwithstanding this, the observations made under each condition are appropriate and can be used to guide further resolution of the stated issues. Minor comment: cross-check with scoring rationales which SI was scored below SG80. For instance, in the condition section, for PI 2.5.2, SIc is indicated but in the scoring rationale, it is SId.		*We feel that the outline conditions provide the necessary identification of issues.* *Noted and revised to 2.5.2 d)*

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes/No**	**Conformity Assessment Body Response**
Justification: CAPs not included		*No CAP received due to overall result*

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

For reports assessing enhanced fisheries please follow the link. (NA)

General Comments on the Assessment Report (optional)

Overall, the assessment team conducted an in-depth and comprehensive assessment of the CVO pulse trawl gear sole and plaice fishery and reached an appropriate conclusion. Addressing issues noted below with some of the PI scores would enhance this bottom line.

During the review of the report, editorial issues were encountered. Rather than providing a detailed list of these (e.g. checking figure and table numbers with text, placing overall PI score rationales in Overall Performance Indicator), it is suggested that the report be given a final read to address formatting and other editorials encountered.

Performance Indicator Review

Please complete the table below for each Performance Indicator which are listed in the Conformity Assessment Body's Public Certification Draft Report.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.1 (plaice)	Yes	No	NA	SIb: A rationale for not scoring at at SG100 is required. It is correct to state that current SSB is at or fluctuating around that SSB implied by fishing at F_{MP} = 0.3, scoring SG80. Re SG100, SSB has been fluctuating around this SSB (about 800kt) over recent years. During 2013-2015, SSB ranged 655 kt – 902 kt (2015 advice). However, can this be stated with a high degree of certainty (Pr>95%)? The PI score of 90 appears to be appropiate but needs additional rationale to support.	Agree and added the rationale in the scoring table.
1.1.2 (plaice)	Yes	Yes	Yes	SIb: It would be useful to add to the rationale that the PA nature of B_{LIM} was confirmed through simulation. Also, while of no consequence to the overall PI score, there is no rationale given for not scoring SIb at SG100. At the time of assessment, the impact of adding Skagerrak to the stock had not been examined which would be a rationale for not scoring SIb at SG100. PI scores 75 (agreed)	Agree and modified the rationale in the scoring table

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.3 (plaice)	NA	NA	NA	NA	NA
1.2.1 (plaice)	Yes	No	NA	SIa: The key difference between scoring at SG80 versus SG100 is one of design. While there are provisions to reduce F as SSB declines, as noted in section 3.3.1, the MAMP does not clearly set out rules (ie. designed as required by SG100) which would apply if SSB declines towards B_{LIM}. SIa should not score SG100. SIb: At SG100, it would be useful to comment on how complete the evaluation of the harvest strategy has been. SId: The HS has been periodically reviewed and improved as necessary. It is just that the most recent downward adjustment of F_{MSY} has not yet been incorporated into the HS. Based on previous experience, this should occur. Not scoring SG100 is a bit harsh. PI scores 95 (appropriate but changes to specific SI scores indicated)	Agree. and modified the rationale in the scoring table Disagree about SId and no change. The HS needs to be tested and previous experience are not enough in my view. Score amended to 90

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.2 (plaice)	Yes	Yes	Yes	SIa: Rationale for not scoring SG80 is appropriate. SIb: An additional rationale for not scoring SG100 is lack of incorporation into the HCR of avoidance of local depletion of the plaice in the Skagerrak. The proposed changes to the HCR have not yet been considered and/or adopted. SIc: Not clear why SG100 does not score. The rationale certainly supports SG100. PI scores 75 (agreed)	
1.2.3 (plaice)	Yes	Yes	NA	SIa,: There is no mention of the information available on the Skagerrak component. This would support SG100. SIc: Is it not the case that the other fisheries have the same level of information as that for the directed fishery? PI scores 90 (agreed)	
1.2.4 (plaice)	Yes	Yes	NA	PI scores 90 (agreed).	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.1 (sole)	No	No	NA	SIa: It is not clear why SG100 does not score. Assuming a 17% CV (which is consistent with assumed uncertainty in estimating B_{PA}), this reviewer estimates that there is about a 96% probability that SSB_{2015} is above B_{LIM}. The team should confirm this calculation and consider scoring at SG100. SIb: $F_{MP} = F_{MSY} = 0.2$. Thus, the target biomass $B_{MP} = B_{MSY}$. As per GCB2.3.2.4, it is incumbent upon the team to explain why B_{PA} is consistent with B_{MSY}. B_{PA} is clearly based on B_{LIM}. There is no indication how it is associated with B_{MSY}. From the EqSim work by the WKNSEA, F_{MSY} ranges 0.11 – 0.37, so a lower estimate of SSB at F_{MSY} would be in the order of 51 kt which is above current SSB. Generation time for sole is about 12.5 year (2.5 +1/0.1). Fishing mortality has been above F_{MSY} since 1957 and has only recently been declining towards this RP. It could be expected that fishing at or below F_{MSY} over 2 generations would produce SSB at F_{MSY} (see GSA2.2.4 of CR2.0) but F has never been at or below F_{MSY}. Thus, while SSB has been increasing, it is not possible to as yet state that current SSB is at SSB associated with F_{MSY}. This SI should not score SG80, requiring the scoring of PI 1.1.3. PI scores 80 (disagree dependent upon re-consideration of scores)	Agree and modified the rationale in the scoring table Sib: Disagree with this point. This guideline is met in terms of F which is at or close to the LTMP reference level and within the range for Fmsy. In terms of the biomass reference level, there are uncertainties about the precise level of Bmsy but it is considered to be in the region above MSY Btrigger. The SSB has been above MSY Btrigger in 2012 and 2013 and is expected to remain at a similar level under the LTMP in 2014-15. Taken together these indicators suggest that the current position of the stock satisfies the second guideline at SG80. The scoring is 90.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.2 (sole)	No	No	NA	SIa and c: The origin of F_{MSY} = 0.2 in the June 2015 ICES advice is not obvious. MSYREF3 (Nov 2014) produced F_{MSY} in the order of 0.35. WKLIFE V (Oct 2015) did consider sole but only to test the CMSY method for data poor stocks. The WKNSEA benchmark meeting (Feb 2015) produced F_{MSY} = 0.39 but makes reference to a post-meeting sensitivity run (page 99 of report) which produced F_{MSY} = 0.2 (0.11-0.37). Is this the origin of 0.2 and if so, is there additional rationale in other ICES reports on this? Notwithstanding this, F_{MSY} appears to range 0.11-0.37. Based upon the EqSim work by WKNSEA, SSB at F_{MSY} would range 50 – 90 kt, with a median of about 75 kt. PI scores 80 (agreed but with changes noted above)	Disagree – no change to the text provided in the scoring report.
1.1.3 (sole)	Scoring required	Scoring required	NA	See comment on PI 1.1.1 (sole)	As 1.1.1scores 80 there is no need of 1.1.3

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.1 (sole)	Yes	No	NA	SIa: As with plaice, The key difference between SG80 and SG100 is one of design. While there are provisions to reduce F as SSB declines, the HS is not designed to reduce F as SSB declines. This SI should not score SG100. PI scores 95 (based on comment above, 85 more appropriate).	Agree. and modified the rationale in the scoring table The resulting score is 85 instead of 95.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.2 (sole)	Yes	No	NA	SIa: rationale indicates SG80 not met while score row indicates that it is. 1.2.2 (plaice) scored SIa at SG60, not SG80 based upon the need for a well defined HCR which reduces F as BLIM is approached. A comparable rationale is justified here, indicating a score of SG60, not SG80. SIb: useful to note that sole does not have the Skaggerak complication. SIc: F had been declining at about 2.5% per year up until 2007 at which time the MAMP was introduced. Since then , F has declined at about 3.4% per year, this rate being higher since 2011. It is not clear what rate of decline would suffice to score SG100. If the intent since 2011 was to reduce F to F_{MSY} within one generation (12.5 years), then F_{MSY} would not be expected until about 2024. If within 0.5 of a generation, then not until 2017. The MAMP does not appear to state a time frame and thus provide an expected rate of F decline. In lieu of this, this SI should score SG100. PI scores 90 (score should be 75, comparable to that of plaice)	Agree. confirm SG 80 in SIa is not met. Agree and modified the scoring table. SIc Disagree because F is not decreasing rapidly enough toward F_{msy} and there is not clear evidence that tools in use are effective in achieving the exploitation levels required under the harvest control rules. Agree it should be 75 instead of 90 and raises a new condition.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.3 (sole)	Yes	No	NA	SIa: This scores SG80, not SG100, based upon the gear designation information. Would this not also apply to this SI for plaice which scored SG100? Either make scores across species consistent or add rationale here why sole is scored differently. SIc: As with plaice, is it not the case that other fisheries have the same level of information as for the directed fishery? PI scores 80 while plaice scores 90. Need to confirm/explain difference.	Agree and modified the scoring table Agree Now scores 90 as with plaice.
1.2.4 (sole)	Yes	Yes	NA	PI scores 90 (agreed).	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.1.1	Yes	No	NA	SIa: Table 3.4.2.1 appears to be for 2014 (based on comparison with table in appendix 6). The rationale states that the percentages were based on 2013 as well but these data do not appear to be provided. These are likely editorials but overall, these tables need to be harmonized between the rationale and appendix 6. It would be useful to state here that both plaice and sole are above PRI (PI 1.1.1 SIa scoring at least 80). Re dab, it is landings of 7,608 t and catch of 76,075 t. Also, best to focus here on status in PI 2.1.1 and consider management in PI 2.1.2. Overall, more support is required for scoring SIa for dab at SG80. Certainly, it is clear that over the long term, landings have fluctuated without much trend as has the survey biomass since the mid-1980s. Thus, the score is likely right – just need more justification. SId: Best to move the PI score synopsis to the Overall Performance Indicator Score box at bottom. PI scores 85 (generally agree with adjustments noted above).	Data for the two years reviewed, but only 2014 presented in appendix 6 to avoid further confusion in an already complex and lengthy report. Text clarifies this. Added Noted and moved. Noted and moved

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.1.2	Yes	No	NA	SIa: Sole or plaice are also a main retained species, dependent upon which P1 species is being assessed. PIs 1.2.1 for these species scored 95 (issues with PIs 1.2.2 though), which would score this SI high for these species. This scoring needs to be added here. In SIa of PI 2.1.1, there is text on the combined dab/flounder TAC which should be moved here as it is relevant to the scoring. Also need to be clear that a partial strategy consists of monitoring, assessment, management response and measures. A TAC by itself is just a measure. It could be argued that the measures in place are expected to keep the three species above PRI, scoring 60. The combined dab/flounder TAC as part of the strategy has been deemed not effective at controlling exploitation. This argues against scoring this SI for dab at SG80. SIb: Given the issue that ICES has raised with the effectiveness of the combined dab/flounder TAC, it is difficult to support this SI at SG80. SIc: Notwithstanding the issues noted in the other SIs with the strategy, it does seem to be implemented successfully, scoring this as SG80. PI scores 80 (disagree given the ICES stated issues with the combined dab/flounder TAC; a score <80 is indicated, raising a condition)	Noted and addressed Noted and score 85 given as some score above, but most below. Noted and moved Not just the TAC: other measure form the partial strategy described, which are effective.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.1.3	Yes	Yes	NA	SIb: Discard information is available since 2002. The data used in this assessment appears to be a sub-sample of the larger dataset. It is important to evaluate whether or not discard rates have changed over years. Was this examined? This clarification should be added. PI scores 80 (agreed).	Discard rates for pulse gear are reported in detail. Text re. other discard data added.
2.2.1	Yes	Yes	NA	SIa: given uncertainty in status of minor discarded species, SG80 score is appropriate. At the bottom of the SIc rationale, the PI synopsis score is provided. Best to move the PI score synopsis to the Overall Performance Indicator Score box at bottom. PI scores 85 (agreed).	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.2.2	Yes	Yes	NA	SIa: As in PI 2.1.2, measures do not equate to a strategy, partial or full. This requires linked measures, monitoring and management response. This appears to be an editorial issue as the list of measures includes measures, monitoring and implies some form of management response. Agree however that these do not equate to a full strategy, not scoring SG100. PI scores 80 (agreed)	Text amended
2.2.3	Yes	Yes	NA	PI scores 80 (agreed)	
2.3.1	Yes	Yes	Yes	The main issue raised in this PI is lack of studies on the effect of the new trawl gear on ETP species, the scoring rationales on which are well articulated. PI scores 65 (agreed)	
2.3.2	Yes	Yes	NA	SIb: At SG100, presumably a longer time series would be needed to allow quantitive analysis which has yet to be conducted and a requirement of SG100. PI scores 85 (agreed)	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.3.3	Yes	Yes	Yes	SIc: SG80 not met in text but is met in score bar. The main issue raised in this PI is the lack of information on the impact of the new trawl gear on ETP species. The SI scores are appropriate and well supported. PI scores 75 but should be 65 (one Y and two Ns at SG80).	Noted and amended to N – score changed to 65
2.4.1	Yes	Yes	Yes	The scoring rationale is very comprehensive and clear, addressing multiple aspects of the fishery – habitat interaction. PI scores 70 (agreed)	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.4.2	Yes	No	Yes	SIa: Measures do not constitute a partial strategy. However, what is stated at the bottom of the rationale does. It would facilitate the understanding of the rationale if that part specific to measures and scoring SG60 was separated from the scoring of the partial strategy under SG80. This is mostly edting. However, need to add why SG100 not met. SIb: It would clarify the SG80 score if there was a more explicit link made between the partial strategy and the reduction in fishing effort and thus habitat impact. SIc: Figure numbers need to be corrected. This doesn't seem to be the correct rationale for not scoring SG80. The lack of specific habitat management plans and thus habitat strategies relates more to the scoring of SG100. The issue at SG80 is whether or not the partial strategy is being implemented successfully. The main weakness in current management arrangements (partial strategy) is the lack of regulation of pulse gear without more knowledge on its impacts. While the SG80 score appears appropriate, the rationale for this requires further consideration. SId: Might be useful to add that the current arrangement of measures, rules, etc are designed to address other than habitat issues. The development of habitat management plans would constitute a strategy. PI scores 75 (generally appropriate but with further consideration of support for SIc score)	Text added re. SG100. Figure numbers revised Disagree – in this case, it is the general management of fisheries within the sites, which are still to be implemented, meaning that there is n evidence that the partial strategy is being implemented successfully.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.4.3	Yes	No	Yes	SIa: It is clear that there is a basic understanding of the main habitat types in the area of the fishery, scoring SG60. What is not so clear is what is known on the vulnerability of the main habitat types to the fishery, particularly pulse gear. Additional text on this is required. Also, explicitly addressing the SG80 and SG100 scores separately would clarify the scoring of each. PI scores 75 (generally agree with additions noted above).	SG100 refers to vulnerable habitats which are well-identified in the area. Sib refers to the vulnerability in terms of 'nature of impact' on those habitats. It is here that we agree that SG80 is not met.
2.5.1	Yes	Yes	Yes	SIa: Sole is mentioned but not plaice, which should be. The main issue raised in this PI is that the limited knowledge on the ecosystem impacts of pulse fishing leaves open the potential for unexpected impacts, which is a valid concern and well articulated. PI scores 70 (agreed)	Added

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.5.2	Yes	Yes	Yes	SIc: need to add rationale on why SG100 not met. SId: rationale to not score SG80 appropriate. PI scores 75 (agreed)	Added re SG100
2.5.3	Yes	No	Yes	SIb: rationale to not score SG80 appropriate. SIc: need to add rationale on why SG100 not met. SIe: The lack of pulse gear identification would also affect the scoring of SG80 here. Would not this prohibit examination of the impact of this gear? This would lower the overall PI score. PI scores 75 (could be lower dependent on re-consideration of SIe score)	Text added. The pulse gear can be identified via VMS and so would inform this aspect, it is the control under a general TBB coding that is a weakness.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.1.1	Yes	No	NA	SIa: Are there binding agreements for P2 species as well? If not, this would lower the score to SG80. PI scores 95 (could be 85 dependent upon SIa score)	Text added: There are also binding EU procedures governing cooperation in relation to P2 e.g. the Birds & Habitats Directive and the Marine Strategy Framework Directive. Score unchanged.
3.1.2	Yes	Yes	NA	SIa: Consolidated reviews for advice by STECF have been discontinued as of 2016, deemed as being unnecessary. This should be confirmed with the DG MARE. MARE now takes its advice directly from ICES. PI scores 95 (agreed)	
3.1.3	Yes	Yes	NA	PI scores 100 (agreed)	
3.1.4	Yes	Yes	NA	PI scores 90 (agreed)	
3.2.1	Yes	Yes	NA	PI scores 90 (agreed)	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.2	Yes	Yes	Yes	SIb: The Osprey assessment scored this SI at 80. The difference appears to be the response of the Dutch authorities to pulse gear. This difference (and others in P3) should be addressed in the harmonization section. SIc and SId: As of 2016, STECF consolidated reviews are no longer being conducted. However, the SG80 is still met wrt the LTMP. Also, same comment as SIb re Osprey fishery. PI scores 75 (agreed); rather than placing synopsis score at bottom of SIe scoring rationale, best to place it in the Overall Performance Indicator Score box.	In terms of harmonization, there are differences between the fisheries and therefore scores will differ, however the overall result does not differ. Text is added in harmonization section to this affect.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.3	Yes	No	Yes	SIa: Comment on the Osprey fishery's score of SG80 for this SI would be useful in the harmonization section. SIb: SG60 is quite a different score and rationale for this SI in the FROMM trammel and Osprey fisheries, which state that there are few issues with enforcement. Are the issues in this assessment specific to this fishery? If so, these should be stated. PI scores 70 (not sure); Two other recent assessments scored this PI as 85 and 100. The reasons appear to be related to the pulse gear. However, for SIb, it is not clear that the issues relate solely to this fishery. This needs to be clarified.	Enforcement issues are specific to the pulse trawl fishery as an appropriate control protocol was not in place and small sole being landed was specific to this fishery. Further clarification is added: Harmonisation: Other certified plaice and sole fisheries (using twin-rig trawl) are scored without a condition. This difference is due to the specific circumstances identified in the pulse trawl fishery.
3.2.4	Yes	Yes	NA	PI scores 80 (agreed)	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.5	Yes	Yes	NA	SIb: STECF no longer undertakes consolidated reviews. Need to check with DG MARE on its further role in the review process. The Osprey fishery scored this SI at SG100 based upon STECF providing regular external review. Now that the STECF no longer provides consolidated reviews, this is rationale for not scoring SG100. However, there may still be a broader review function for STECF which should be confirmed with DG MARE. PI scores 80 (agreed)	Text added: STECF is established under EC Reg 2016/ 74/05) to provide advice to the EC and reports in response to DG MARE requests, which may be considered 'occasional external review'. Article 3: Consultation: The Commission may consult the group on any matter relating to marine and fisheries biology, fishing gear technology, fisheries economics, fisheries governance, ecosystem effects of fisheries, aquaculture or similar disciplines. The Commission may require the adoption of such an opinion within a defined period. In agreement with the Commission services the group may also provide opinions on its own initiative to the Commission on such matters. The chair of the group may advise the Commission to consult the group on a specific question.

Any Other Comments

Comments	Conformity Assessment Body Response
No further comments.	

PR 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: In view of all the inherent uncertainty relating to a wide spectrum of potential environmental effects of this relatively new fishing method the team have rightly assed this fishery as not meeting the MSC standard at Principle 2. The assessment would also have resulted in twelve relevant Conditions against all three Principles. I do not know whether or not this fishery was subject to a pre-assessment, but quite clearly all the issues, in Principle 2, against which the fishery failed would have been highlighted in that process and it would have been unlikely to have proceeded to full assessment at this point in time.		

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes**	**Certification Body Response**
Justification: All the 12 Conditions raised are well justified and appropriate. I am assuming that, because the fishery failed and the conditions are not applicable, they do not have to be constructed according to the protocol CR v1.3 27.11 and there is no requirement for a Client Action Plan.		*This is also the AT view following discussions with Acoura.*

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes/No**	**Certification Body Response**
Justification: Not applicable, see comment above.		

General Comments on the Assessment Report (optional)

This is an exceptionally well written and clearly constructed assessment report. The layout of the report made following the evidence, in relation to the scoring of each performance indicator, very easy. I have made a number of comments in relation to the scoring and the scoring comments. Whilst these need to be addressed, none of them are substantial and they do not affect the conclusions and outcome of this assessment in any way.

This report is full of valuable information, in relation to this relatively new method of fishing, which is well supported by relevant and up to date references. The plates and Figures are also extremely useful and serve to provide excellent support to the text.

I regard this assessment report as a benchmark for this type of fishery anywhere in the ICES area and the team was absolutely right to fail the fishery against the requirements of Principle 2.

The professionalism and dedication of this team is epitomised by their commitment to spend a whole day at the International Pulse Symposium. In this way they appraised themselves of the most up to date research and thinking on the controversial topic of pulse trawling.

Performance Indicator Review

Please complete the table below for each Performance Indicator which are listed in the Certification Body's Public Certification Draft Report.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
Example:1.1.2	*No*	*No*	*NA*	*The certifier gave a score of 80 for this PI. The 80 scoring guidepost asks for a target reference point that is consistent with maintaining the stock at Bmsy or above, however the target reference point given for this fishery is Bpa, with no indication of how this is consistent with a Bmsy level.*	
1.1.1	Plaice - No Sole - No	No No	N/A N/A	Need to justify scoring issue b) not meeting the SG 100 (95% P) Need to justify scoring issue b) not meeting the SG 100 (95%P)	Agree and modified the scoring tables of sole and plaice.
1.1.2	Plaice - Yes Sole - No	Yes No	Yes -the issue is identified and well reasoned at Si c) and this is a harmonised Condition. N/A	Scoring OK but but at SI b) you need to clearly mark and justify the failure to meet SG100 At scoring issue b) should be at SG 100. Blim has not been set at Bloss which is the ICES default status but has been	Agree and modified the scoring table. Disagree: There is no clear stock-recruitment relationship on which to base Blim. Therefore the limit reference point is not in agreement with MSC standards.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
				well established staistically based on the breakpoint in a segmented regression. This is accepted as best practice for setting Blim when the relevant data are available.	
1.1.3	N/A	N/A			
1.2.1	Plaice – Yes Sole -Yes	Yes Yes	N/A N/A	Well reasoned at all scoring issues. As above	
1.2.2	Plaice – No Sole - Yes	No No	Yes (this is a harmonised Condition) N/A	Scoring issue a) meets SG 100. It is implicit in the MAMP that Blim is well protected by Bpa and that exploitation is reduced each year if SSB falls below Bpa The scoring comments do not match the score at Si a). There is simply a statement that SG 80 is not nett but with no rationale	In 1.2.2 there is not SG 100 in the scoring issue a. Rationale is provided both for sole and plaice that SG 80 is not met at SI a.
1.2.3	Plaice- Yes Sole- No	Yes No	N/A	All scores well reasoned and justified. Rejection at SG 100 (a) is harsh. The raft of available information for the North Sea is comprehensive. Any weknesses are adequately addressed in the	Agree to put the same rationale of plaice and met SG 100 in SIa.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
				reduced score at Si b)	
1.2.4	Plaice – Yes Sole - Yes	Yes Yes	N/A N/A	Si d) should probably score 100 Well reasoned reduced score at Sia	
2.1.1	Yes	Yes	N/A	A complex issue well described in both the report and scoring comments	
2.1.2	Yes	Yes	N/A		
2.1.3	Yes	Yes	N/A	Ver well reasoned scoring comments	
2.2.1	Yes	Yes	N/A	A complex issue as the management moves towards full implementation of the landings obligation by 2019. Not clear whether the final comment under Si c), justifying an 85 score refers to the whole performance indicator or only c). Need to clarify.	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
2.2.2	Yes	Yes	N/A		
2.2.3	Yes	Yes	N/A	Well supported 80 score with scoring comments and the information in the report.	
2.3.1	Yes	Yes	Yes. Some of the measures needed are already in place	The lack of verifiable information on the direct and indirect impact of this type of fishing on ETP species is very well addressed in the report and scoring coments for each of these performance indicators (2.3.1, 2.3.2 and 2.3.3)	
2.3.2	Yes	Yes	N/A	See comments at 2.3.1	
2.3.3	Yes	Yes	Yes The introduction of the EU landings obligation will begin to address some of these issues but there is still a need for more information related specifically to the effects of pulse fishing methods	See comments at 2.3.1	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
2.4.1	Yes	Yes	Yes	The habitat impacts of standard beam trawls are well described and render that method highly unlikely to reach the requirments of the MSC standard at this performance indicator. Whilst sea bed impact of the pulse trawl is clearly less than the standard beam the evidence is not well established in relation to electric impulse impact. This is made very clear by this team in their report and scoring comments for each of these performance indicators. (2.4.2, 2.4.2, 2.4.3). They have been well informed in this context by attending the International symposium on Pulse fishing.	
2.4.2	Yes	Yes	Yes	See 2.4.1 above	
2.4.3	Yes	Yes	Check the wording of the Condition 7 statement as it does not support a Condition. It states that	Lack of relevant information at scoring issue b) rightly generates the Condition here.	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
			*sufficient data **are** available*		
2.5.1	Yes	Yes	Yes	Well supported rationale describing all the uncertainties surrounding this relatively new fishing method. Strategies appear to be in place but clearly there is currently not enough information, specific to pulse trawling, on impact and whether or not the strategies are working.	
2.5.2	Yes	Yes	Yes	See comments above	
2.5.3	Yes	Yes	Yes	See comments above	
3.1.1	Yes	Yes	N/A	Why has the score been reduced to 95 with no rationale?	Rationale added
3.1.2	Yes	Yes	N/A		

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
3.1.3	Yes	Yes	N/A	The CFP is exceptionally well covered in the text of the report	
3.1.4	Yes	Yes	N/A	An interesting and well, reasoned explanation of the partial score at SG 100!!	
3.2.1	Yes	Yes	N/A	A well reasoned partial score for this PI	
3.2.2	Yes	Yes	Yes	A well researched explanation of why the fishery doers not achieve the SG 80 level at scoring issues b) and c). The final comment at scoring issue (e) is a general one and should be moved to 'overall performance indicator score section'	
3.2.3	Yes	Yes	Yes	Normally for a North Sea fishery this PI for monotoring control and surveillance would score highly. This score of 70 with a Condition is generated by the new challenges of managing the pulse fishing method and developing the	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Certification Body Response
				relevant protocols. The complex technicalities of the gear clearly present the authorites with problems not previously experienced.	
3.2.4	Yes	Yes	N/A	A typical score for this PI.	
3.2.5	Yes	Yes	N/A		

Any Other Comments

Comments	Certification Body Response
The report deserves a wider readership than will be generated by this assessment process.	

Appendix 3. Stakeholder submissions

Appendix 3a.

Written submissions from stakeholders received during consultation opportunities on the announcement of full assessment, proposed assessment team membership, proposed peer reviewers, proposal on the use or modification of the default assessment tree and use of the RBF.

The following stakeholder submissions were made following the announcement of full assessment:

Marine Conservation Society

The following email was submitted by the stakeholder on the The 26th of June 2015. The questions referred to in the third paragraph take the form of a letter to the Implementation Group from January 2015. This letter is included as Appendix 7 given that it directly states the stakeholder's position. The report which is referred to (and is not included here) is *Protecting the Commons: the use of Subtidal Ecosystem Engineers in Marine Management by Braekman et al. 2014*

"Dear Mr Hynes,

I understand that you are requesting consultees to ask you questions related to MSC certification of Dutch Pulse Beam trawl fishing in the North Sea? Could you please add myself as an official stakeholder in the consultation process?

Our organisation has been contacted by Christine Absil, who suggested we become a stakeholder with regard to this fishery, particularly because of our concerns about such fishing in southern North Sea N2K sites, and the lack of any appropriate assessment of such fishing in these sites.

As you'll see we've raised specific scientific questions with UK government authorities over such fishing in N2K sites in UK waters. We believe these need answering before such a fishing method can be permitted in EMS. Bottom towed fishing – of all kinds in Southern North Sea sites – must be conducive to site integrity of sandbank features, and the favourable conservation status of the species hosted by the sandbanks – that includes the natural biological communities that live in and on these banks.

Many issues remain as to the management of offshore sandbank sites we believe, regards legality and process. The development of a new fishing gear without prior appropriate assessment of implications for ecosystems is certainly very troubling, and probably illegal within SACs.

Attached is a peer-reviewed paper on site integrity we've developed to put the legal briefing in scientific context.

Unfortunately I can't attend the workshop next week on July 2nd. Christine Absil is aware of our organisation's stance on this.

Kind regards,

Jean-Luc"

Royal Society for the Protection of Birds

The CVO pulse sole and plaice fishery – MSC assessment
Comments from RSPB/BirdLife International

Overview

We urge the CAB to give due attention to the inadequate level of knowledge and thus high degree of uncertainty concerning the potential impact of pulse trawling on benthic communities in the southern North Sea.

We raise this especially in regard to scoring against:

Principle 2 - PI 2.5.3 = *There is adequate knowledge of the impacts of the fishery on the ecosystem.*

- PI 2.3.1 = *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*.
- PI 2.3.2 = *The fishery has in place precautionary management strategies*...etc [with regard to ETP species]
- PI 2.3.3 = *Relevant information is collected to support the management of fishery impacts on ETP species*...etc.

1. Policy context

1.1 MSFD

The critical policy framework is Directive 2008/56/EC of the European Parliament and of the Council – the Marine Strategy Framework Directive, which requires Member States to achieve or maintain good environmental status (GES) of their marine waters by 2020. In the context of pulse trawling, the key qualitative descriptors (D) for determining GES are:

D1: Biological diversity is maintained.

D3: Populations of all commercially exploited fish and shellfish are within safe biological limits.

D4: All elements of marine food webs... occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.

And especially in relation to pulse trawling:

D6: Sea-floor integrity is at a level which ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

Having determined a set of characteristics for GES consistent with these descriptors, Member States have set targets and monitoring programmes for ongoing assessment, and finally must establish and implement programmes of measures (on the basis of the precautionary principle) designed to achieve or maintain GES in the waters concerned.

1.2 The Nature Directives

There is particular concern about pulse trawl impacts on sandbanks protected by European Marine Sites, a major issue for the bodies charged with implementing the 'Revised Approach' to Natura 2000 (especially SAC) site assessment being undertaken by Defra's Implementation Group[19]. The UK's

[19] Consisting of representatives from MCS, ClientEarth, WTs, IFCAs, NE, JNCC, MMO and Defra.

Marine Conservation Society /ClientEarth judge that it is highly unlikely that pulse trawling could be allowed to continue under Art 6 of the Habitats Directive:

> '...until satisfactory *Before, After, Control, Impact* (BACI) science is carried out to prove otherwise, over a range of habitats, and at the scale of the site's ecosystem, we do not believe that an absence of adverse effects on site integrity can be proven. This, of course, is a requirement both of Article 6(2) and 6(3) of the Habitats Directive.'

1.3 Common Fisheries Policy

The resolution of the extent to which pulse fishing complies with an ecosystem-based approach to fisheries management is also an urgent issue for the current development of the EU's Multi-Annual Plan for mixed fisheries for demersal stocks in the North Sea. The report (not on-line, prepared by the Commission services but not representing their official position) of the second Scoping Workshop on the North Sea MAP (Brussels, 29-30 Sep 2014) includes the following conclusions from the break-out group on environmental considerations:

'Integrating ecosystem considerations in the MAP must begin with a strong cross reference to environmental legislation (Marine Strategy Framework Directive and nature directives) in the regulation as well as on a map or audit of the impacts of mixed fisheries on the ecosystem in the area under the MAP's management. The MAP should outline how it contributes to specific GES targets. In terms of potential measures, the group discussed the need for new gear in the mixed fisheries to be assessed also for their potential impacts on the ecosystem. They spoke of the need for the MAP to foresee a "triage"-like toolbox of measures to prevent bycatch of sensitive species (commercial and non-target species) (see annex 1). This group also underscored the importance for the MAP to be able to react and adapt to changing environmental circumstances and conditions.'

2. RSPB Evidence

We welcome innovation and maintain an open mind about the potential presumed benefits of pulse trawling but we share the significant concerns of other e-NGOs about its rapid expansion without sufficient research to determine ecosystem impacts of what is essentially still an experimental fishery. Despite monitoring and research by IMARES, the scaling up of licensing to now 91 vessels is disproportionate with so many questions still unanswered. ICES[20] advised further research and stressed that pulse trawling should only continue on a limited, highly regulated scale, although his has not stopped fleet expansion under derogations.

2.1 The state of research into the Dutch pulse trawl fishery

We are aware that a certain amount of research has already been carried out by IMARES to compare the impacts of beam and pulse trawling on the benthos[21]. However, the original scope was limited and, with more questions raised than answered, there remain considerable knowledge gaps and uncertainties, as is evident in the study's Conclusions:

Differences in the physical impacts of the two gear types are evident, with tickler chains penetrating the

seabed to a larger extent then the pulse gear. Note also that due to the gears used and the weather

conditions encountered, the estimates of these differences may be conservative.

In terms of sediment resuspension, no clear differences are found between the gears.

Biological impacts were more difficult to ascertain. It is expected that the coarse bottom and dynamic

[20] ICES (2012) Request from France to review the work of SGELECTRA and to provide an updated advice on electric pulse trawl. Special request, November 2012. Book 1.5.6.1.

[21] Lorna R. Teal, Jochen Depestele (ILVO, BE), Barry O'Neill (Marlab, UK), Johan Craeymaersch, Daniel van Denderen,Ruth Parker (Cefas, UK), Jack Perdon, Hans Polet (ILVO,BE), Mascha Rasenberg, Bart Vanelslander (ILVO, BE),Adriaan D. Rijnsdorp (2014) **Effects of beam and pulse trawling on the benthic ecosystem.** Report number C098/14. IMARES – Wageningen UR. Pp. 53.

nature of the experimental area could make it a less vulnerable habitat to trawling. A large proportion of

the biomass encountered was described as resistant to trawling to start with. Trawling impacts are likely

to be context-dependant with habitats where species are adapted to a more dynamic nature being less

vulnerable than stable habitats where natural disturbances are very low or infrequent.

In order to address the habitat dependant nature of the trawling impact, a second BENTHIS campaign

was carried out in June 2014 on the muddy grounds of the Frisian Front. Results are expected by 2015.

The most up-to-date assessment of knowledge gaps is systematically described by Quirijns et al (2015)[22] . The authors concede (p. 6) that:

Despite the large number of studies that have been carried out, several topics need more investigation:

- *Indirect (or delayed) mortality*
- *Non-mortal effects*
- *Effects on reproduction*
- *Long term effects on species that encounter pulse trawl gear and on their populations*
- *Minimum and maximum values for pulse characteristics (is there a 'safe range'?)*
- *Effects of pulse fishing on early life stadia of marine organisms that reproduce in shallow water*
- *Effects on seabed, substrate and water column: can the use of pulse result in dissolving toxic chemicals?*

As the authors point out (p. 31), some elements of the research agenda call for long term research, which will be subject to a tendering process with the Dutch Ministry of Economic Affairs; the tender concerns four studies:

- *Effect on marine organisms; predictive model of the distribution of the electrical field in various organisms and their effect on activity and survival of fish and benthic invertebrate taxa*
- *Effect on the benthic ecosystem; predictive model of the impact of electrical pulses on benthic ecosystem functioning*
- *Effect on the seabed; predictive model on the small scale distribution of the fleet in relation to the nature of the seabed characteristics*
- *Field study in areas with different fishing regimes*

Appendix A of Quirijns et al (2015) itemises the issue of potential impact on elasmobranchs, an issue of particular concern to RSPB in the context of our prioritisation of ETP species and also legal Member State obligations under the MSFD. ICES had expressed concerns that the effect on electro-receptor organs of elasmobranchs was unknown and, given that stocks of these fish were in decline, special conservation measures might be required. The existing knowledge is that elasmobranch organs are very sensitive to electric currents but that (only) cat shark has so far been studied as an indicator species. The knowledge gap is that exposure to pulse trawls may impede the ability of elasmobranchs to detect prey, and that this may apply also to rays. A PhD study will aim to address these gaps.

[22] Quirijns, F., Strietman, B., Marlen, B. Van, Rasenberg, M. and Smith, S.R. (2015) **Flatfish pulse fishing**: Research results and knowledge gaps II. IMARES – Wageningen UR. Pp. 39.

The authors concede that these research projects (both the pilot as well as the tendered studies) 'will start in 2015 and take 4 years'. In addition to this pilot project on flatfish, there will be a designated research agenda for shrimps with the aim of answering: 'What are the (in)direct effects on the marine ecosystem of fishing with shrimp pulse gear?'

The research agenda to address these knowledge gaps was further elaborated (in a powerpoint presentation[23]) by Adriaan Rijnsdorp at the International Dialogue Meeting on Pulse Fisheries in Scheveningen, 2 July 2015 (attended by RSPB).

Rijnsdorp outlined (slide 32) the programme of work to pursue the above research agenda with the overall aim to deliver an *'Impact assessment* [of the*] transition* [of] *beam trawl to pulse trawl flatfish fishery'*. As part the future research programme he cited the three PhD studies (also listed in Appendix A of Quirijns et al (2015)) with the following respective objectives:

1) *To develop a predictive model on the distribution of the electrical field in various organisms and their effect on activity and survival (model species to include roundfish, sharks and rays, bivalves, crustaceans, polychaetes, sea urchin)*
2) *To develop a predictive model of the impact of electrical pulses on benthic ecosystem functioning, in particular on the biogeochemistry*
3) *To develop predictive models of the ecosystem effects (bycatch, proportion of injured fish, benthic ecosystem functioning) on the level of the fleet and North Sea*

Rijnsdorp's overall conclusion (slide 40) was that the pulse trawl research programme was:

- *Ambitious*
- *Funding is not secured yet*
- *Must have* [versus] *Nice to know*

The formal account of the Scheveningen meeting are not yet available and in any case they are unlikely to include the detailed oral exchanges. However from RSPB's (Euan Dunn's) written notes taken at the time, Rijnsdorp made the following verbatim remarks on particular slides in his presentation:

Title slide: '*The aim is to enable us in a couple of years to make an ecological impact assessment of the pros and cons'*.

Slide 28 (referring to the research in Governance and in particular 'Control and enforcement to be assured'): '*Constraints on the settings of safe use – we need that in a couple of years' time'.*

Slide 34 (referring to box 2.4: 'Field experiments on the effect on seabed ecosystem'): '*We are using the closed areas in the Central Oystergrounds; we can compare pulse and beam trawl fishing with reference plots, in two years time*'.

Slide 35 (referring to PhD 1): '*Can't look at everything but need a representative set of taxa with a given body-plan so we can extrapolate to others and build a predictive model in two years' time*'.

In the light of these statements, I posed the question in the plenary Q&A discussion session:

Euan Dunn: '*Aware that this fishery is under MSC assessment but that you said several times you would get more information in two years' time, isn't it true that research into this fishery is just in its infancy*?'

Adriaan Rijnsdorp: '*Yes*'.

23 http://pulsefishing.eu/sites/pulsefishing.eu/files/150702%20Presentation%20Adriaan%20Rijnsdorp_0.ppt

Jerry Percy (Low Impact Fishers of Europe – LIFE') responded with: '*Building on what Euan said, we have nearly 100 pulse vessels, little research, a shift onto soft ground, we're seeing injuries and damage to fish in the Outer Thames where it's a pre-spawning stock entering the Thames... so all this is going ahead with negligible research understanding'*.

2.2 RSPB conclusions on the state of knowledge

1.1 The RSPB accepts that there is now a much more comprehensive programme of research planned and underway but concludes from this presentation and the subsequent oral exchange that:

a) Answers to major questions will not be forthcoming for at least 2 years (Rijnsdorp presentation) and fully so until 4 years (Quirijns et al 2015). Even assuming that the findings are robust and unequivocal, this time delay is before any of them are comprehensively able to inform adaptive management and operational conditions of the pulse trawl fishery. As Quirijns et al (2015) points out (App A, p. 38) in a masterpiece of understatement: 'Decision framework and models are not fully developed'.

b) This state of implementation of research means there is far from 'adequate knowledge of the impacts of the fishery on the ecosystem' (PI: 2.5.3).

c) The state of implementation of research currently gives no confidence on potential impacts on species likely to be most sensitive to electrical pulses, namely sharks and rays (including ETP species like common skate and blonde ray), because:

- 'Relevant information' *will* be collected but this has yet to be done (PI 2.3.3)
- It cannot be guaranteed that the fishery will not 'pose a risk of serious or irreversible harm' to these species (PI 2.3.1), *and therefore that...*
- The fishery is already operational on a major fleet scale without the knowledge and understanding to 'have in place precautionary management strategies' with regard to these ETP species (PI 2.3.2)

d) The conditions under which this fishery operates in these respects is potentially regressive in relation to the Marine Strategy Framework Directive obligations of Member States under D6 (Sea-floor integrity).

2.3 Information relayed to the RSPB by fishermen

The RSPB was contacted (by email) in February 2012 by an active UK fisherman, Matthew Barnes, operating in the Outer Thames, who wished to express his concerns about the impact of widescale Dutch pulse fishing in the waters just outside the UK 12-mile limit. The Thames fishermen have also been asking for a reference area closed to pulse trawling just outside the 12nm limit to enable a properly controlled assessment of pulse trawl impacts.

Our informant raised a number of issues as follows (the fisherman's words in quotes from his emails):

- The high level of fishing effort, threatening their own small-scale fishery:
  "They are 42 metre ships, there has been about 10 working off here recently, but before then we have had 4-5 for the last 3 years."

- That the fishery was potentially damaging to the Outer Thames Estuary SPA[24] (designated for wintering red-throated diver *Gavia stellata*):
  " It seems to me that if there is even the slightest chance that this gear may harm a diving bird of any kind it's use must not be allowed, especially in the Outer Thames estuary with its rich diving bird life, It seems a risk far beyond any other type of fishing ever used." [Note that the SPA extends beyond the UK 12-nm territorial limit]

- The level of collateral damage to fish stocks:

  "...the amount of fish killed by this gear that are not caught is horrendous."

- Illegal incursion of pulse fishing inside UK territorial waters:

  "The gear is used up to the 12mile limit and also vessels are coming inside this line but cannot seem to be caught." "They (MMO) know it's been reported but the VMS never picks them up as being inside [the 12-mile limit], when in fact they are."

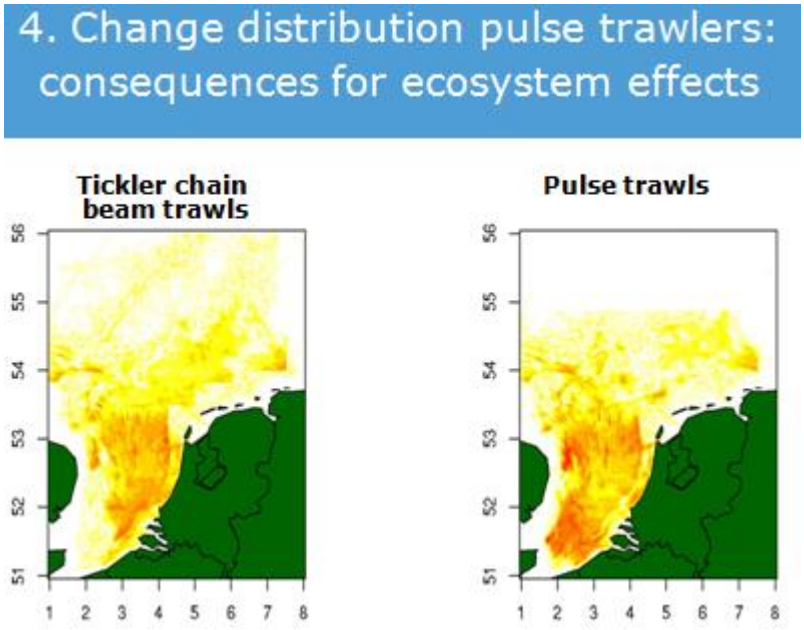
While the RSPB has no reason to doubt these claims, we cannot independently corroborate them. Nevertheless, they do raise important questions about monitoring, control and enforcement, and they endorse the position of STECF[25] that control and enforcement issues should be resolved before the number of vessels using pulse trawls can be increased.

The negative reaction of the Outer Thames fishermen, while it might have been expected under any circumstances, is also indicative of the lack of timely consultation by CVO with stakeholders, whether inshore small-scale fishermen or those more focussed offshore (notably the North Sea Advisory Council, on which BirdLife is represented and chairs its Spatial Planning Working Group). This serious deficit is belatedly acknowledged by Quirijns et al (2015 – se App A, p. 38: Governance issues).

The fisherman's testimony about the escalation of pulse-fishing in his area is also consistent with what we know about the shift in the spatial distribution of pulse trawling compared with traditional beam trawling, graphically illustrated by Adriaan Rijnsdorp (Scheveningen meeting, 2 July 2015):

[24] http://publications.naturalengland.org.uk/publication/3233957

[25] STECF (2012) 39th Plenary meeting report of the Scientific, Technical and Economic Committee for Fisheries (STECF-PLEN-12-01). (eds. Casey, J. And Doerner, H.) Publications Office of the European Union, Luxembourg, EUR 25303 EN, JRC 70759. ISBN 978-92-79-24753-8. Pp. 112.



Pulse trawling is clearly exerting substantially more fishing effort in the south-western North Sea, with the greatest fishing intensity of all being hard up against the UK's 12-mile limit, and notably just off the Outer Thames estuary. This also demonstrates another property of pulse fishing – its ability to exploit softer substrates than beam-trawling. The spatial footprint of pulse trawling has therefore expanded and heightened the potential for competition with the exploitation of the traditional sandbank grounds of UK small-scale fishermen.

This also raises the possible concern that the elaborate ongoing research programme by IMARES might not be adequately addressing the potential impact of pulse fishing on the sorts of soft, sandy substrates which are more prevalent in the UK than the Dutch EEZ.

3. RSPB Overview

While we agree that pulse trawling offers potential environmental, social and economic benefits over traditional beam trawling, that is not the issue at stake here in terms of MSC assessment. What concerns us is that an essentially experimental fishery has been licensed to grow to industrial proportions by the grace of legal derogations, and with negligible prior consultation with stakeholders, to the extent that it is already highly operational in the North Sea with too limited an understanding of its environmental impacts or any overall assessment of its sustainability. IMARES openly admits that better understanding will take up to 4 years or more to emerge.

Under these conditions, RSPB believes that the scoring of the fishery, especially against P2 which concerns us most, should be appropriately low.

RSPB and BirdLife have been formal supporters of the MSC project since its inception and we have endorsed certification of fisheries where, even though there were major environmental concerns, we could see that passing the fishery or applying appropriate conditions would rapidly improve its performance, but only because the knowledge base and the technological solutions were already in place or largely fulfilled. We can cite the South African demersal hake trawl fishery which BirdLife supported certifying by MSC in 2008 despite the fact that it incurred an annual incidental bycatch of 18,000 seabirds at the time, most of them endangered albatross species. However, and this is the key, the technical solutions (mitigation measures) to solve this impact were already known at the time and only needed political will and the incentive of MSC certification to implement them with due urgency in the fishery. As a result, this bycatch has now been reduced by 99%[26].

[26] http://www.birdlife.org.za/conservation/seabird-conservation/albatross-task-force

The difference between that example and the CVO pulse sole and plaice fishery is that the technological fixes are by no means yet known, so embryonic is the fishery and its research programme. Indeed we do not yet know what some of the operational challenges may yet be because, apart from the known unknowns there are still likely to be too many unknown unknowns.

Our overall conclusion is that it was premature of the pulse fishery to enter assessment but, now that it has done, the CAB's scoring should reflect the unacceptable state of the evidence base. To do otherwise poses, among other things, a serious reputational risk to the MSC programme.

Appendix 3b.

All written and a detailed summary of verbal submissions received during site visits pertaining to issues of concern material to the outcome of the assessment[3] regarding the specific assessment.

Interviews with Environmental NGOs (WWF and Nordsee Foundation) provided an opportunity for these parties to raise concerns in relation to the experimental nature of the pulse trawl gear. These re-iterated the written responses presented in Appendix 3a.

Appendix 3c.

Explicit responses from the assessment team to submissions described in **a.** and **b.** above.

The Assessment Team has given full consideration to the written and verbal submissions received from stakeholders, along with the background information provided therein.

The result (P2 not achieving 80 overall and therefore failing to meet the MSC standard) reflects the uncertainties in the impacts by this new gear. These were clearly stated during interviews and further discussed at the International Symposium on Pulse Trawling by stakeholders, including scientists specialising in pulse gear research. The symposium itself was an opportunity for stakeholders to hear what is known so far, what is unknown, and what research is planned as part of a pilot project, which provides temporary derogation for the use of pulse trawl gear.

Therefore, while it is apparent that the pulse gear affords many environmental and economic benefits in comparison to traditional beam trawling, it is too soon to determine the wider impacts of the gear on the environment to the extent required to achieve a P2 score of 80 or more overall.

Appendix 3.1 Amendments made to the PCDR following stakeholder consultation

Details to be added at FR (Final Report) stage

Appendix 4. Surveillance Frequency

Table A4: Fishery Surveillance Plan

Score from CR Table C3	Surveillance Category	Year 1	Year 2	Year 3	Year 4
[e.g. 2 or more]	[e.g Normal Surveillance]	[e.g. On-site surveillance audit]	[e.g. On-site surveillance audit]	[e.g. On-site surveillance audit]	[e.g. On-site surveillance audit & recertification site visit]

Source: Acoura assessment team

Appendix 4.1 Rationale for determining surveillance score

…

Appendix 5. Client Agreement

Acoura confirm that the client has reviewed the Public Certification Report and is in full agreement with the terms of certification detailed therein.

Appendix 5.1 Objections Process

Box below for guidance - please delete, along with this note.

The report shall include all written decisions arising from an objection. *(Reference: CR 27.19.1)*

Appendix 6. Landings and Discard sampling data

See section 3.4.2 for reference to the tables below.

Table 3.4.2.1 Reference fleet data for 2014 to calculate bycatch for pulse trawlers. Data are rounded to kilos, so 0kg weight implies <0.5kg. (Table compiled by P2 assessor, based on data supplied by IMARES)

Scientific Name	English Name	Type	Weight kg	%	% of catch (discard + landing)
Pleuronectes platessa	European plaice	Discards	63	24.9	39.5
		Landings	37	14.6	
Limanda limanda	Common dab	Discards	40	15.8	17.8
		Landings	5	2.0	
Solea solea	Common sole	Discards	9	3.6	19.0
		Landings	39	15.4	
Salvelinus malma	Dolly varden	Landings	7	2.8	2.8
Merlangius merlangus	Whiting	Discards	6	2.4	2.8
		Landings	1	0.4	
Callionymus lyra	Dragonet	Discards	4	1.6	1.6
Microstomus kitt	Lemon sole	Discards	3	1.2	1.2
Psetta maxima	Turbot	Discards	1	0.4	1.6
		Landings	3	1.2	
Raja montagui	Spotted ray	Discards	3	1.2	1.2
Scophthalmus rhombus	Brill	Discards	1	0.4	1.6
		Landings	3	1.2	
Chelidonichthys lucerna	Tub gurnard	Discards	2	0.8	0.8
Eutrigla gurnardus	Grey gurnard	Discards	2	0.8	0.8
Raja clavata	Thornback ray	Discards	2	0.8	0.8
Scyliorhinus canicula	Small-spotted catshark	Discards	2	0.8	0.8
Trisopterus luscus	Pouting (=Bib)	Discards	2	0.8	0.8
Ammodytes spp	Sandeels	Discards	1	0.4	0.4
Aspitrigla cuculus	Red gurnard	Discards	1	0.4	0.4
Clupea harengus	Atlantic herring	Discards	1	0.4	0.4
Gadus morhua	Atlantic cod	Discards	1	0.4	0.8
		Landings	1	0.4	
Glyptocephalus cynoglossus	Witch flounder	Discards	1	0.4	0.4
Lophius piscatorius	Angler (=Monk)	Discards	1	0.4	0.4
Melanogrammus aeglefinus	Haddock	Discards	1	0.4	0.4
Mullus surmuletus	Surmullet	Discards	1	0.4	0.4

Scientific Name	English Name	Type	Weight kg	%	% of catch (discard + landing)
Mustelus spp	Smooth-hounds nei	Discards	1	0.4	0.4
Platichthys flesus	European flounder	Discards	1	0.4	0.4
Raja brachyura	Blonde ray	Discards	1	0.4	0.4
Raja radiata	Starry ray	Discards	1	0.4	0.4
Scomber scombrus	Atlantic mackerel	Discards	1	0.4	0.4
Solea lascaris	Sand sole	Discards	1	0.4	0.4
Sprattus sprattus	European sprat	Discards	1	0.4	0.4
Trachurus trachurus	Atlantic horse mackerel	Discards	1	0.4	0.4
Zeus faber	John dory	Discards	1	0.4	0.4
Aequipecten opercularis	Queen scallop	Discards	0	0.0	0.0
Buccinum undatum	Whelk	Discards	0	0.0	0.0
Cancer pagurus	Edible crab	Discards	0	0.0	0.0
Crangon crangon	Common shrimp	Discards	0	0.0	0.0
Loligo spp	Common squids nei	Discards	0	0.0	0.0
Mytilus edulis	Blue mussel	Discards	0	0.0	0.0
Pagellus erythrinus	Common pandora	Discards	0	0.0	0.0
Sepia officinalis	Common cuttlefish	Discards	0	0.0	0.0
Solen spp	Solen razor clams nei	Discards	0	0.0	0.0
Spisula solidissima	Atlantic surf clam	Discards	0	0.0	0.0
	Total		253		

Source: IMARES 2015

Table 3.4.2.2 Total landings pulse trawlers in 2014 (kg) (raw data from IMARES; % as calculated from total landings)

Scientific name	English name	Landings (kg)	%
Pleuronectes platessa	Plaice	18136447	54.94
Solea solea	Sole	8021062	24.30
Limanda limanda	Dab	1729326	5.24
Psetta maxima	Turbot	1041130	3.15
Platichthys flesus	Flounder	908833	2.75
Trigla lucerna	Tub gurnard	769813	2.33
Scophthalmus rhombus	Brill	676730	2.05
Gadus morhua	Cod	329152	1.00
Cancer pagurus	Edible crab	255677	0.77
Microstomus kitt	Lemon sole	179965	0.55
Merlangius merlangus	Whiting	176178	0.53

Scientific name	English name	Landings (kg)	%
Buccinum undatum	Whelk	114375	0.35
Eutrigla gurnardus	Grey gurnard	91585	0.28
Raja clavata	Thornback ray	89127	0.27
Trisopterus luscus	Bib	69019	0.21
Sepia officinalis		59699	0.18
Crangon crangon	Common shrimp	59267	0.18
Raja montagui	Spotted ray	58174	0.18
Aspitrigla cuculus	Red gurnard	42840	0.13
Lophius piscatorius	Anglerfish	41257	0.12
Scyliorhinus canicula	Lesser spotted dogfish	35021	0.11
Dicentrarchus labrax	Sea bass	28226	0.09
Raja brachyura	Blonde ray	25049	0.08
Martialia hyadesi	Sevenstar flying squid	14680	0.04
Lolliguncula spp	Thumbstall squids	11587	0.04
Nephrops norvegicus	Norway lobster	9558	0.03
Mullus surmuletus	Red mullet	6195	0.02
Homarus gammarus	European lobster	5898	0.02
Leucoraja naevus	Cuckoo ray	5030	0.02
Carcharias taurus		3843	0.01
Loliginidae	Squids	3324	0.01
Merluccius merluccius	Hake	2160	0.01
Trachinus draco	Greater weever	2120	0.01
Rajidae sp.		1276	0.00
Galeocerdo cuvier	Tiger shark	1220	0.00
Trachinus vipera	Lesser weever	1105	0.00
Melanogrammus aeglefinus	Haddock	830	0.00
Trachurus trachurus	Horse mackerel	726	0.00
Pollachius virens	Saithe	441	0.00
Anarhichas lupus	Wolffish	300	0.00
Lepidorhombus whiffiagonis	Megrim	272	0.00
	Total	33008517	

Source: IMARES 2015

Appendix 7. Letter from Marine Conservation Society to the Pulse Implementation Group.

15th January 2015

Dear members of the Implementation Group,

RE: Pulse trawling in European Marine Sites

We would like to circulate the attached paper (Braeckman et al 2014[1]) to the Implementation Group as we believe it be a vital contribution to understanding the value and role of typical species in sandbank communities in the North Sea, which will affect the work being done with regard to Defra's Revised Approach to the management of European Marine Sites.

This paper contributes to the range of available peer-reviewed research[2] on interactions between bottom towed fishing gears and sand, gravel and muddy habitats. As a result of such research – and the broad balance of findings, we consider any direct physical (beam trawls) or electrical penetration (pulse trawls) into the sediments as being more serious than light rigged gear on these habitats for the burrowing species outlined in this paper. In terms of ecological impact on sandbanks, in particular those protected by European Marine Sites, pulse beam trawling must be considered separately to beam trawling. Both of these conclusions will be important for the work of the Implementation Group, particularly affecting how such habitats are considered by the Inshore Fisheries Conservation Authorities, Natural England, JNCC, The Marine Management Organisation and Defra in the context of the Revised Approach.

In relation to pulse trawling that is primarily carried out by Dutch fleets in the North Sea, both ClientEarth and MCS are continuing to engage and learn more about this trial form of fishing through participation in the North Sea Advisory Council (NSAC). While we have an open mind about the potential benefits of this form of fishing (particularly to the industry), we do have concerns about the rapid expansion of the use of pulse gear without sufficient scientific research to ascertain impacts to the marine ecosystem, particularly given the research already referred to. This is particularly relevant given the extent to which such fishing is being undertaken in European Marine Sites designated to protect sandbank features.

In addition, as part of our work in the NSAC, it is becoming more apparent that very little is known about the impacts of this type of fishing on sandbank communities at an ecosystem level. It follows, that based on the current information available on this type of fishing, it is highly unlikely that this could be allowed to continue under Article 6 of the Habitats Directive for Natura 2000 sandbank sites. Therefore, until satisfactory 'Before, After, Control, Impact' (BACI) science is carried out to prove otherwise, over a range of species and habitats, and at the scale of the site's ecosystem, we do not believe that an absence of adverse effects

[1] Braekman, U., Rabaut, M., Vanaverbeke, J., Degraer, S., Vincx, M. (2014). Protecting the commons: the use of subtidal ecosystem engineers in marine management. *Aquatic Conserv: Mar. Freshw. Ecosyst.*
[2] Refer to Natural England's compilation of papers on impacts of trawls in sand, gravel and mud habitats for bottom towed gears.

on site integrity can be proven. This, of course, is a requirement both of Article 6(2) and 6(3) of the Habitats Directive.

The media in the UK has made great play of the 'dead fish' factor[3] caused by such fishing, but there is also the dead burrowing infauna that is likely left behind by such gear that is probably of equal if not more concern – and we haven't seen any findings in the literature to allay the concerns that the species outlined in Braeckman et al. (or their functional equivalents), are not damaged by such gears.

We set out in Annex 1 to this letter the scientific questions and/or tests that we believe need to be addressed before pulse fishing can be permitted within European Marine Sites in accordance with Article 6. That is, the gear must be proven to not have significant adverse impacts on the various ecological components of sites BEFORE being permitted for use in European Marine Sites. Such questions are also relevant for widespread use of pulse trawling elsewhere in the North Sea under its current trial phase and we note that an identical list of questions were also submitted to the NSAC by Samuel Stone and Dr Solandt of MCS on 19 December 2014.

These questions are fundamental – at the scale of sites before such potentially damaging, and community-altering gear should be allowed in European Marine Sites.

We also refer you again to the MCS and ClientEarth legal briefing from July 2013[4] that re-iterates that it is necessary for the feature, and *species and habitats associated with the feature* to be at favourable conservation status (point 2, page 1) – see Annex 2.

Both ClientEarth and MCS would welcome further discussion amongst Implementation Group members to discuss the impacts of pulse trawling within European Marine Sites that are designated for sandbank features and potential management scenarios for such sites. This is obviously a very pertinent issue for the ongoing negotiations being carried out by Defra in relation to management of offshore sites in the North Sea and we would therefore like to request that this topic is tabled as a formal agenda item for the next Implementation Group meeting.

Yours sincerely,

Dr Jean-Luc Solandt
Senior Biodiversity Policy Officer
Marin Conservation Society

Catherine Weller
Lawyer
ClientEarth

[3] http://www.thesundaytimes.co.uk/sto/public/searescue/article1067315.ece
[4] Natura 2000 and the meaning of 'site integrity', MCS and ClientEarth, July 2013, also accessible at http://www.clientearth.org/reports/natura-2000-site-integrity-briefing.pdf

Annex 1

Scientific questions / tests that need to be addressed before pulse fishing can be permitted in European Marine Sites (and elsewhere):

1. How much of the benthic community dies from such gear? What species, how deep, and what is the impact on biomass of different species – and their functional roles – at different depths of the sand communities? What are these effects at different frequency's / voltage / amplitude?

2. What are the sub-lethal effects on different benthic species (i.e. behaviour, fracturing of bones, disruption of nervous systems, digestive performance, food uptake, reproduction, disease)?

3. What is the impact on plankton?

4. Does electrifying the sea around the seabed have an effect on water chemistry both in the water column, and between the sand grains? Does it make it more acidic or alkaline? What are the longer term impacts of these effects that remain in the sandbank habitat after the passage of the gear?

5. What are the effects of killing species on the (reduced) recirculation of both nutrients and oxygen as is highlighted in Braekman et al. (2014) as being a positive result of the natural species assemblages, and their functional roles in sandbanks?

6. We need this information (Q1-4) from both individual study areas within sandbank communities, and also the wider impact such mortalities may have on mobile migratory communities (e.g. fish, seals, porpoise) that rely on a healthy food web in sites. Evidence needs scaling up to the size of sites such as North Norfolk sandbanks.

7. What are the cumulative impacts of pulse trawling, and traditional beam trawling?

8. Furthermore, what are the opportunities for vessels to change the strength of their electric fields they emit beyond the levels at which the gear is tested? What is there to prevent fishers from 'turning up' the power of the electric field beyond that measured in controlled experimental conditions?

Annex 2

Briefing

Natura 2000 and the meaning of 'site integrity'

12 July 2013

Executive Summary

This briefing provides a legal analysis of the meaning of site integrity in the context of the Natura 2000 network and particularly of Article 6 of the Habitats Directive,[1] reviewing both domestic and European case law and EU Guidance on the concept of site integrity and confirming the following points:

1) The overarching aim of the Natura 2000 network is to achieve favourable conservation status of habitats listed in Annex I and habitats of species listed Annex II of the Habitats Directive,[2] and of regularly occurring migratory bird species and the species set out in Annex I of the Birds Directive.[3] In considering whether a site's integrity will be affected, Member States must have regard to the site's conservation objectives. In this regard, the site's overall conservation objectives will extend beyond an isolated consideration of the Annex I habitats and Annex II species (or relevant bird species) contained within the site and take account of the wider ecological context of the site as a whole in terms of its effects on the designated features.[4] At the same time, according to the recent Court of Justice of the European Union (CJEU) decision in *Sweetman*, site integrity must be determined by reference to 'the lasting preservation of the *constitutive characteristics* of the site concerned that are connected to the presence of a priority natural habitat whose preservation was the objective justifying the designation of that site' (emphasis added).[5] Both indirect as well as minimal adverse affects on a site are relevant (*Feeney*[6] and *Akester*[7]).

2) These cases are able to show that the favourable conservation status of a listed natural habitat or of the habitat of a listed species (and linked to it site integrity) extends beyond focusing on merely protecting the natural habitat or the habitat of the species

[1] Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive).
[2] Article 3(1) the Habitats Directive.
[3] Directive 2009/147/EC on the conservation of wild birds (the Birds Directive).
[4] See case C-258/11 *Peter Sweetman, Ireland, Attorney General, Minister for the Environment, Heritage and the Local Government v An Bord Pleanala* (*Sweetman*) at para 43; also Article 6(1) Habitats Directive's reference to the 'ecological requirements' of designated features; and Commission Note on Setting Conservation Objectives for Natura 2000 Sites, 23/11/2012, p. 5, part 4, 2nd para.
[5] *Sweetman* at para 39; see also paras 48-49.
[6] *Sean Feeney v Oxford City Council* [2011] EWHC 2699 (Admin).
[7] *R (Akester & Anor) (On Behalf of the Lymington River Association) v Dept for Environment, Food and Rural Affairs and Wightlink* [2010] EWHC 232 (Admin) Case No: CO/1834/2009.

itself for which the site has been designated or classified. One of the reasons this is possible is because the way that 'conservation status' and 'favourable conservation status' are defined includes the consideration of factors beyond the state of the designated feature itself, and extending to the relevant surroundings/influences and other contributing functions, which determine conservation status. For example the relevant definitions require the following considerations: distribution, structure, function and abundance;[8] *'typical species'*;[9] whether a species is a 'viable component of its natural habitat'; and a sufficiently large habitat to maintain populations on a long-term basis.'[10] Any evaluation of site integrity must be made with these factors in mind.

3) The concept of 'site integrity' relates equally to situations involving an assessment of a 'plan or project' and also to prevention of deterioration (habitats and species) or disturbance (to species).[11]

4) The requirement for prevention and a strict application of the precautionary principle is required for any assessment of effects on site integrity according to the EU Treaty and EU case law.[12]

5) Member States must only permit/allow the continuation of an activity within the Natura 2000 network 'if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects'.[13]

Introduction and legislative background

6) The Habitats and Birds Directives together set out to establish a 'coherent European ecological network' of protected areas across the EU, called the Natura 2000 network,[14] as one of the main mechanisms through which to achieve the Habitats Directive's main objective, which is to contribute towards ensuring biodiversity through the conservation of natural habitats and wild fauna and flora.[15] This network consists of Special Areas of Conservation[16] (SACs) designated under the Habitats Directive and Special Protection Areas[17] (SPAs) classified under

[8] Article 1(e) and 1(i) Habitats Directive.
[9] Ibid Article 1(e).
[10] Article 1(i) Habitats Directive.
[11] See Case C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse vereniging tot Bescherming van Gogels v Staatssecretaris van Landbouw, Natuurbeheer en* Visserij (*Waddenzee);* relevant to Article 6(2) and 6(3), Habitats Directive.
[12] See Article 191(2), Treaty on the Functioning of the European Union and *Sweetman* at paras 41, 48 and 49, and *Waddenzee* at paras 57 and 58.
[13] *Waddenzee*, at paras 59 and 61; see also *Sweetman* at para 40.
[14] See Article 3(1) Habitats Directive.
[15] Article 2(1) Habitats Directive.
[16] Article 3(1) Habitats Directive.
[17] Article 4(1) and 4(2) Birds Directive.

the Birds Directive. In the marine context, Natura 2000 sites are often referred to as European Marine Sites. The term European Marine Sites is used in domestic legislation[18] however this is not legally defined in the Habitats Directive.

7) To further one of the main goals of the Habitats Directive (maintaining or restoring, at favourable conservation status natural habitats and species of wild fauna and flora of Community interest[19]), the Natura 2000 network is meant to enable the natural habitats (listed in Annex I) and the habitats of the species (listed in Annex II) to achieve or maintain favourable conservation status. This also applies to migratory birds and the species listed in Annex I of the Birds Directive[20] in relation to which SPAs are designated, [21] and it is generally accepted that 'favourable conservation status' is broadly equivalent to the requirements of Article 2 of the Birds Directive.[22]

8) The aim of the Natura 2000 network is therefore to protect the most seriously threatened habitats and species across Europe by enabling the natural habitat types and habitats of relevant protected species to be maintained and restored at favourable conservation status.[23]

9) Article 6 of the Habitats Directive sets out the provisions governing the conservation and management of Natura 2000 sites. Article 6 therefore plays an influential role in establishing the relationship between conservation and activities (plans or projects) affecting SACs and SPAs.

10) Accordingly, this briefing focuses on Article 6, and in particular provides an analysis of the concept of 'site integrity', which is contained in Article 6(3). Through a review of relevant case law, EU Guidance on Article 6 of the Habitats Directive, and taking into consideration the wider context and purpose of the establishment of the Natura 2000 network, this briefing establishes that Member States will only comply with Article 6 of the Habitats Directive (and where relevant Article 4 of the Birds Directive) if able to show that they have taken the appropriate steps to ensure that Annex I habitats and the habitats of Annex II species (and also relevant bird species) within Natura 2000 sites are being maintained or restored to achieve favourable conservation status.

11) So far as this relates to management decisions affecting SACs or SPAs, the requirement for favourable conservation status of a listed natural habitat extends beyond the habitat for which the site has been designated or classified. There are several reasons for this,

[18] The Conservation of Habitats and Species Regulations 2010 No.490 (UK).
[19] Article 2(2) Habitats Directive.
[20] Article 4(1) and 4(2) Birds Directive.
[21] See Articles 3 and 7 Habitats Directive.
[22] See also EC Guide to Sustainable Hunting under the Birds Directive (2008), para 2.4.14.
[23] Article 3(1) Habitats Directive.

which are linked closely to some of the underlying definitions in Article 2 of the Habitats Directive, which are discussed below in paragraphs 38-43.

A summary of Article 6 of the Habitats Directive

12) Article 6(1) of the Habitats Directive requires Member States to establish 'necessary conservation measures' and 'appropriate statutory, administrative or contractual measures' for SACs, which correspond to the ecological requirements of the relevant protected habitats or species present on the site. In addition, Article 4(4) of the Birds Directive requires Member States to 'take appropriate steps to avoid pollution or deterioration of habitats or any disturbance affecting birds in so far as these would be significant having regard to the objectives' of Article 4.

13) By virtue of Article 7 of the Habitats Directive, the following obligations contained in Articles 6(2), (3) and (4) are also applicable to SPAs established under the Birds Directive. For the remainder of this briefing, SACs, Annex I habitats and Annex II species under the Habitats Directive will be referred to. However, the arguments are equally applicable to SPAs and the species mentioned in Articles 4(1) and 4(2) of the Birds Directive.

14) Article 6(2) requires Member States to 'take appropriate steps to avoid .... the deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, in so far as such disturbance could be significant in relation to the objectives of this Directive.'

15) The obligations arising under Article 6(2) are summarised in European Commission Guidance, as follows: Article 6(2) 'takes as the starting point the prevention principle ... These measures go beyond the simple management measures necessary to ensure conservation since these are already covered by Article 6(1). The words 'avoid' and 'could be significant' stress the anticipatory nature of the measure to be taken. It is not acceptable to wait until deterioration or disturbances occur before taking measures'.[24]

16) The requirement for prevention was confirmed by the judgment of the CJEU in *Commission v Ireland*[25] where the Court ruled that a proper transposition of the preventive obligations within Article 6(2), could not be 'merely a reactive measure'[26] but that such protection afforded by Article 6(2) 'requires that individuals be prevented in advance from engaging in potentially harmful activities.'[27] See also Advocate-General

[24] 'Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (2000) p.24.
[25] C-418/04 *Commission of the European Communities –v- Ireland*.
[26] Ibid para 217.
[27] Ibid para208. In this case for example, the introduction of a procedure to allow the minister to seek injunctive relief in response to damage of an SPA did not go far enough to transpose the obligations required under Article 6(2) of the Habitats Directive.

Kokott in *Commission v UK* who confirms the requirement for prevention under Article 6(2).[28]

17) Following on from the preventative measures laid out in Article 6(2), Article 6(3) of the Habitats Directive sets out a two pronged approach of procedural safeguards:

a) for any 'plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon' there must be an 'appropriate assessment' of the plan or project's 'implications for the site in view of its conservation objectives'; and

b) after Member States have undertaken the appropriate assessment and in light of the conclusions of that assessment, the plan or project may only be granted permission to proceed if it can be 'ascertained that it will not adversely affect the integrity of the site concerned'.

18) An analysis of situations that invoke the application of Article 6(3), and in what circumstances the 'appropriate assessment' would be required, is beyond the scope of this briefing. Instead, this briefing will focus on the concept of site integrity.

19) Finally, for completeness, Article 6(4) provides that if, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must be carried out for reasons of overriding public interest (and in relation to priority species or habitats then such public interest is restricted to human health or public safety), necessary compensatory measures must be undertaken to ensure that the overall coherence of Natura 2000 is protected.

20) In summary, Article 6(2) has an emphasis on preventative measures and Articles 6(3) and (4) set out a series of procedural and substantive safeguards governing plans and projects likely to have a significant effect on a Natura 2000 site. It is important to note, however (and as discussed in more detail in the following paragraphs), that the preventive measures set out in Article 6(2) are not intended to be less effective than the procedures set out under Article 6(3).

The meaning of 'site integrity'

21) The concept of 'integrity of the site', which must not be adversely affected, is only specifically referred to in Article 6(3). It is not defined.

22) A starting point for any attempt to define the concept of site integrity is, somewhat self-evidently though importantly, the recognition of the nexus between 'integrity' and the

[28] C-6/04 *Commission of the European Communities –v- United Kingdom* [2005].

'site'. The legislation is clearly drafted so that it is 'site' integrity, which is the relevant consideration, rather than the integrity of a specific habitat or species for which a particular site may have been designated. 'Site' is defined in the Directive as a 'geographically defined area whose extent is clearly delineated'.[29]

23) The judgment of the CJEU in *Sweetman*[30] has provided recent clarification on the concept of site integrity. This case relates to a proposal for a road bypass, which would bring about partial and permanent loss of an Annex I habitat, which the site was partially designated to protect (namely limestone pavement). The judgment provides a ruling on the 'criteria in law to be applied by a competent authority to an assessment of the likelihood of a plan or project the subject of Article 6(3) of the Habitats Directive, having an adverse effect on the integrity of the site'.[31]

24) In its reasoning, the Court recalls previously established jurisprudence to the effect that 'the Habitats Directive has the aim that the Member States take appropriate protective measures to preserve the *ecological characteristics* of sites which host natural habitat types' (emphasis added).[32] Therefore, the judgment explains, in order for the integrity of a site not to be adversely affected, the site needs to be preserved at a favourable conservation status, and this entails 'the lasting preservation of the constitutive characteristics of the site concerned that are connected to the presence of a natural habitat type whose preservation was the objective justifying the designation of that site...'.[33]

25) Paragraph 43 of the judgment states furthermore that 'competent national authorities cannot therefore authorise interventions where there is a risk of lasting harm to the ecological characteristics of sites which host priority natural habitat types'.

26) The conclusions of the *Sweetman* judgment clearly support a holistic approach to the site's constitutive characteristics where such characteristics are connected to the protected habitat or habitat of a relevant species and to the question of whether 'site integrity' is affected. Specifically, any intervention in a site which will 'prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site', will be held to be an 'adverse effect on site integrity'.[34] The arguments in this case are expressed to apply *a fortiori* to priority natural habitat types - and we would argue that it would also be applicable to any natural habitat covered by Annex I.

[29] Article 1(j) Habitats Directive.
[30] See footnote 4.
[31] Ibid para 18.
[32] Ibid para 38.
[33] Ibid para39.
[34] Ibid para 48.

27) The requirement to consider a site's constitutive characteristics as elaborated in *Sweetman* is consistent with the fact that even activities conducted away from the immediate boundary of a protected habitat, which is a qualifying feature of a site, are capable of affecting a site's conservation objectives. This could be by means of an indirect effect on the feature (e.g. damage to a sandy area, affecting abundance of molluscs and crustaceans available as food for predators occurring on protected reef features). It could further be by adversely affecting the site as a whole and its ecological resilience and functioning, or by the removal (by extractive fishing) of a key species that provides an essential ecological role to the maintenance of a protected habitat's favourable conditions. Whilst the case of *Sweetman* itself concerns damage directly to an area of Annex I habitat, it nevertheless provides clear confirmation that consideration of the ecological functioning of a site with regard to the designated features is necessary.

28) The European Commission's guidance 'Managing Natura 2000 Sites'[35] has also set out guidance on the meaning of site integrity. It confirms that the integrity of the site relates to the site's conservation objectives. Further consideration of a site's conservation objectives is provided in the following section. However, before examining this, it may be useful to cite the EU Guidance example of when a site's integrity will *not* be affected:

> if 'a plan or project will adversely affect the integrity of a site only in a visual sense or only habitat types or species other than those listed in Annex I or Annex II.....the effects do not amount to an adverse effect for purposes of Article 6(3), provided that the coherence of the network is not affected'.[36]

29) The EU guidance is not legally binding and arguably in relation to site integrity should now be updated in light of the recent *Sweetman* judgment. The above example will, however, assist administrators in making decisions about activities which have superficial effects on an SAC in conservation terms. For example, line fishing for mid-water fish such as sea bass or mackerel has negligible impact on reef features of many SACs.

30) In relation to *'habitat types or species other than those listed in Annex I or Annex II'* referred to in the above extract, the EU guidance also refers[37] to the definition of 'integrity of the site' used in the UK's PPG 9, UK Department of the Environment of October 1994 (now superseded), namely: 'the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitats, complex of

[35] Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC.
[36] Ibid p. 41.
[37] Ibid p. 39.

habitats and/or the levels of populations of the species for which it was classified'.[38] This definition, which has been applied in the UK, also confirms that adverse effects to part of a site, even if not a part which is a designated feature, are relevant to a consideration of site integrity to ensure a coherent approach to a site's ecological function across its whole area.

31) The draft Defra guidance 'The Habitats and Wild Birds Directives in England and its seas' published in December 2012, also defines the integrity of the site as '....the coherence of its ecological structure and function across its whole area, or the habitats and/or populations of species for which the site has been (or will be) designated.'[39]

32) Considering domestic case law, in the case of *Feeney*,[40] the High Court granted summary judgment to a local authority following a challenge to the authority's development plan. In considering the complainant's case, which was that there was no sufficient finding that the development plan would not 'adversely affect the integrity of the site', the judgment equated 'not adversely affecting integrity of the site' with 'not causing harm'.[41]

33) In *Akester,*[42] the High Court considered whether the introduction of a new type of ferry into the service on the Lymington to Yarmouth route, which passes through an SAC, should be considered to be a 'plan or project' under Article 6(3). In accepting that the ferry could potentially adversely affect the natural surroundings, the judgment states at paragraph 77 that: 'The question is whether the activity gives rise to a risk of adverse effects on the protected sites, whether directly or indirectly'.

34) The judgement in *Akester* also briefly touches on an oral submission by the defendant, which amounted to a *de minimis* argument, whereby the adverse effects which were reported were agreed to be minimal. The court confirms that given the high level of protection afforded by Article 6(3) any such argument 'is not an argument which would of itself have carried sufficient weight to remove any doubt as to a possible adverse effect.'[43]

35) The approach of the UK Courts is consistent with the conclusions stated below that the critical consideration in relation to site integrity is not the extent or degree of an impact, or whether an impact is direct or indirect, but whether the implications of any activities affecting a site, either individually or in combination with other plans or projects, affect the site's ability to achieve its conservation objectives and favourable

[38] This definition seems to have been misquoted in the EU Guidance and the definition as set out in the superseded PPG9 Guidance has been set out here.
[39] The Habitats and Wild Birds Directives in England and its seas, Core guidance for developers, regulators and land/marine managers, December 2012 (Draft for public consultation), para 60.
[40] See footnote 6.
[41] Ibid para 79.
[42] See footnote 7.
[43] Ibid para 117.

conservation status. These conclusions are also consistent with, and must be applied in the light of, the judgment in *Sweetman*.

36) By way of example, an indirect effect could be the suspension of sediments by beam trawlers outside an SAC, smothering filter feeding animals inside the site; or the capture of cockles such as to reduce the food supply of oystercatchers (as in the in the Wash or Morecombe Bay SACs). The indirect effects of water quality outside an SAC can have damaging consequences for the health of the coral populations attached to the seabed within the site.

37) The ruling in *Akester* in relation to the *de minimis* argument is also consistent with the application of a precautionary approach explored further at paragraphs 53 - 58.

'Conservation objectives', 'conservation status' and 'favourable conservation status'

38) As also noted above, the primary goal of the Habitats Directive is the achievement of *favourable conservation status*[44] for habitats listed in Annex I and the habitats of species listed in Annex II. Achieving the 'conservation objectives' for a site, which term arises in the first limb of Article 6(3), is a principle means for achieving this overall aim.

39) As already mentioned, Article 6(1) of the Habitats Directive states that conservation measures need to correspond to the *ecological requirements* of the natural habitats and species listed in Annexes I and II. The European Commission's Note on Setting Conservation Objectives for Natura 2000 Sites similarly makes it clear that '[s]ite level conservation objectives should be based on the *ecological requirements* of the natural habitat types and species' (emphasis added).[45]

40) 'Conservation status' is defined in Article 1 of the Habitats Directive as the 'sum of all influences' acting on natural habitats or species by reference to factors such as distribution, structure, function and abundance,[46] thereby also determining that it is not just the state of the designated feature itself, but also of its relevant surroundings/influences, which determine conservation status. Moreover, the conservation status of a listed natural habitat automatically includes its typical species, and it will only be taken as *'favourable'* if the status of its *'typical species'* is itself also favourable.[47] It is also defined by the continued availability of 'the specific structure and functions which are necessary for its long-term maintenance' and a stable or increasing

[44] See Article 3(1) and 4(4) of the Habitats Directive.
[45] See footnote 4.
[46] Article 1(e) and 1(i) Habitats Directive.
[47] Ibid Article 1(e).

natural range.[48] Favourable conservation status of a natural habitat therefore goes beyond the simple protection of the relevant natural habitat and extends not only to typical species, which exist within a protected site in connection with a protected habitat, but also other contributing ecological functions.

41) For protected species, conservation status includes the need to be a 'viable component of its natural habitat' and a requirement that 'there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.'[49] Moreover, Article 3(1) of the Habitats Directive requires the habitats of species for which an SAC is to be designated to be maintained or restored at favourable conservation status. The 'habitats of species' are defined in Article 1(f) as 'an environment defined by specific abiotic and biotic factors, in which the species lives at any stage'. Again, this encompasses much wider factors than merely the protected species itself. Any consideration of site integrity must be made with this in mind.

42) The site's conservation objectives and the meaning of site integrity are closely linked. The draft Defra guidance confirms the widely recognised approach that for any decision in relation to adverse effect on the integrity of a site, the competent authority must take into account the site's conservation objectives. As seen above in relation to the Habitat Directive's framing of the concept of '*site* integrity' as opposed to integrity of a particular feature, the conservation objectives under Article 6(3) are also referred to by reference to the site and not to the designated features.

43) Implicit in the Habitat Directive's drafting therefore is a recognition that the Annex I and II designated features do not exist in a vacuum but by reference to the larger geographically defined area of the site (and this of course sits within the 'coherent ecological network' which is the Natura 2000 network). It is therefore the site as it relates to the designated features – in addition to the designated features themselves – which requires protection.

44) The typical species of a reef in the UK's southern SACs would include filter feeding attached bryozoans, hydroids, and motile species such as brown crab. These species can however be found off bedrock reef, on thin sandy sediments over rock, boulders, and on cobbles. The management of sites must therefore take account of the full potential range of the constituent species typical of reefs.

45) It follows that the obligation to prevent any deterioration or disturbance, or to withhold permission for a plan or project under Articles 6(2) and (3), will extend to situations where the typical species of a site designated for an Annex I habitat or of the habitat of an Annex II species are being adversely affected so as to threaten the favourable conservation status of the designated habitat. Moreover, through focusing on

[48] Ibid.
[49] Article 1(i), Habitats Directive.

(favourable) conservation status, the following can be provided as an illustration for protection required under Article 6: Member States would need to ensure that any typical species of a site designated for an Annex 1 habitat must be capable of maintaining itself on a long term basis as a viable component of its natural habitat (based on population dynamics data on the species concerned). If this test was not passed for typical species of a designated Annex 1 habitat, then a Member State would be in breach of its obligations under the Habitats Directive.

46) The English domestic judgments and the European judgments, in combination with the EU Guidance, illustrate that a critical consideration is whether conservation objectives and the ability for a site to meet a 'favourable conservation status' of a natural habitat type or designated species or a habitat of a designated species, may be affected by a particular activity proposed or taking place in an SAC. The EU Guidance is clear that some impact on a site, which does not affect the conservation objectives of a site and the ability of the site to meet favourable conservation status, is permissible under the terms of the Habitats Directive. This, however, as put beyond doubt by the judgment in *Sweetman*, does not extend to mean that it is only the integrity of the specific feature, which is of interest. The concept of site integrity is clearly set in a wider consideration of the constituent elements and ecological characteristics of the site in so far as they affect the status of the qualifying features.

Relationship between Articles 6(2) and 6(3)

47) Article 6(3) applies specifically to potential plans or projects in Natura 2000 sites and introduces the requirement to undertake an appropriate assessment. Article 6(2) is broader in scope and it is applicable to the performance of all activities within SACs, even those which will not invoke the application of Article 6(3) and the requirement of an 'appropriate assessment'. The CJEU has established that the concept of adversely affecting the integrity of a site should not be confined to Article 6(3) situations involving an assessment of a plan or project and will equally apply to Article 6(2).

48) The judgment in *Commission v French Republic*[50] applied the earlier rulings of the *Waddenzee* case and *Commission v Ireland*[51] and confirmed that 'Article 6(2) and 6(3) of the Habitats Directive seek to ensure the same level of protection'.[52] This judgment also confirms that the relevant domestic provision in question could only be regarded as consistent with Article 6(2) if it is ensured that the relevant activities cause no disturbance likely to significantly affect the objectives of the Directive.[53]

[50] C-241-08 *European Commission v French Republic.*
[51] C-418/04 *Commission of the European Communities –v- Ireland* at para 30.
[52] Ibid.
[53] Ibid para 32.

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49) The Opinion of the Advocate-General in *Waddenzee* states that the 'standard of protection [established in Article 6(2)] would not be provided if authorisation were granted even though reasonable doubts existed as to the absence of adverse effects on the integrity of the site concerned'.[54] Put another way, the standard of protection established under Article 6(2) will not be met unless it can beyond reasonable doubt be made certain that the integrity of the site will not be adversely affected.

50) Conversely, when deciding that the plan or project will not adversely affect the integrity of the site concerned under Article 6(3), any such plan or project must also exclude deterioration and significant disruption under Article 6(2).[55]

51) The clear and consistent guidance provided by the CJEU confirms that Articles 6(2) and (3) are to be applied with equal stringency in their protection of SACs and SPAs and therefore a test to be applied to both Article 6(2) and 6(3) is whether a particular activity will adversely affect the integrity of the site and whether sufficient measures are being taken to prevent adverse effects on site integrity.

52) The case of *Sweetman* also states that Article 6(2) and Article 6(3) are also designed to ensure 'the same level of protection of natural habitats *and habitats of species'* (emphasis added).[56] This further confirms that in relation to species which are designated features of SACs, the relevant habitats and constituent ecological characteristics are also relevant to determining the adequate protection of the site with regard to the relevant feature.

Precautionary Principle

53) Further to the requirement for prevention as discussed above, the precautionary principle must always be applied within the context of Article 6.

54) As set out in the *Waddenzee* judgment at paragraph 44, the precautionary principle is one of the foundations of the high level of protection pursued by EU policy on the environment. This is in accordance with Article 191(2) of the Treaty on the Functioning of the European Union and it is with reference to the precautionary principle that the Habitats Directive must be interpreted.

55) The *Waddenzee* judgment is unequivocal in its application of the precautionary principle to the approval of a plan or project in accordance with Article 6(3) and there must be no reasonable scientific doubt that a plan or project will not have an adverse affect on the

[54] Para 118.
[55] Para 117.
[56] Para 32.

integrity of the site, before it can be approved. If such doubt remains as to the absence of such effects, then the plan or project must not be approved.[57]

56) In addition, competent authorities are required to undertake appropriate assessments and make their decisions on the basis of the best scientific knowledge available[58] and if there is not sufficient evidence to make a decision as to whether the integrity of the site will be adversely affected, then a precautionary approach must be taken. This is an essential plank of the Directive as far as the protection of marine sites is concerned, as within the marine environment there is often a considerable lack of knowledge of the specific distribution of seabed features within SACs and SPAs.

57) Most recently, *Sweetman* confirms the primacy of the precautionary principle[59] as integrated into Article 6(3), stating that '...the authority must refuse to authorise the plan or project being considered where uncertainty remains as to the absence of adverse effects on the integrity of the site..' and further that 'the authorisation criterion laid down in the second sentence of Article 6(3) Habitats Directive integrates that precautionary principle'.[60]

58) Following from paragraphs 47-52 in relation to a similar equating of the Article 6(2) and 6(3) obligations (see above), this burden of proof and the application of the precautionary principle should also be applied in respect of any preventative measures undertaken pursuant to Article 6(2).

[57] See paras 56 and 57 of the *Waddenzee* judgment. See also Defra guidance: The Habitats and Wild Birds Directives in England and its seas, Core guidance for developers, regulators and land/marine managers, December 2012 (Draft for public consultation), para 64.
[58] *Waddenzee* at para 54.
[59] Ibid para 40 and 41.
[60] Ibid para 41.

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Appendix 8. Client response to Preliminary Draft Report

On the following pages is the client's written response from the client to the preliminary draft report. This is followed by Acoura's response.

Appendix 8.1 Client Response

CVO, Wouter van Broekhoven and Jurgen Batsleer, 6 April 2015
Comments on the second version of the Client Draft Report

We would like to thank the assessment team for their reconsideration, and for taking a fuller view of the additional information provided.

However, there remain some areas where the decisions taken are inconsistent with other similar assessments and/or with MSC guidance.

In particular, while we accept that there are some information gaps, primarily in relation to effects on benthic habitats, and we are fully committed to dealing with these gaps as we go forward, what we find unacceptable are several instances where issues are scored under multiple PI's. Under the MSC standard, it is clear that issues are to be evaluated under one PI, and below we present the main cases where multiple scoring has affected the assessment score for P2 in the second version of the CDR negatively. This occurs most prominently between PI2.4 and PI2.5 We urge the team to critically re-evaluate the assessment in this light.

Some additional points are made below; the PI's are addressed in numerical order.

PI 2.3.1
SIa
The Ekofish PCDR (PLA042) scores 100 for this SI on the basis that the client fleet are acting in accordance with Article 12 of regulation 104/215. The same holds true for the pulse fishery. Therefore, the scoring should be the same. SG100 is met.

SIc
Indirect effects are considered and are thought to be unlikely to create unacceptable impacts. Some effects are described in the PCDR to justify a sub-par score on this indicator, but these effects are not considered in other certificates. Moreover, the first point below is one example of a parameter counted under multiple PI's. SG 80 is met.

1. Effects on invertebrates (as prey items) are discussed, but we note that these have been considered elsewhere in PI 2.4.1 where there is considered "*no significant increase (of pulse) compared to the … physical impacts of the gear*". In addition, other MSC assessments of the same species in the same area do not consider non-capture effects of fishing gear on invertebrates as prey items for ETP species (e.g. the MSC-certified Dutch North Sea Plaice and Sole Fishery assessment; the PCDR of January 2016 for Ekofish Group North Sea (ICES IVb) twin rigged otter trawl plaice fishery; the Osprey Trawlers North Sea ICES IVb twin rigged plaice fishery assessment).
2. Indirect effects on ETP species (notably elasmobranchs) have not only been considered, but have in fact been subject to direct experimentation. Section 3.4.6 outlines some of these studies, with the conclusion that there are not likely to create any significant (or detectable) indirect effects on ETP species.
3. This point was also made in response to version 1 of the CDR: "Examples of indirect effects include such issues as how does the pulse affect survivability of benthic egg cases of elasmobranchs, or egg masses of other benthic species, when it passes across." We are very confident to say that this information is not available for any fishery in the North Sea, and in other certificates effects on eggs are not considered.

PI 2.4.1.

We welcome the assessment team having taken due account of the nature and extent of the fishery. However, the final scoring takes a very precautionary stance – scoring below 80 because the footprint (fishing areas) used have only been defined based on a single partial fishing year. While this is true, the area fished for beam trawls has been well established, and pulse-trawlers operate within a subset of this (see IMARES report C146A.15 as supplied in November 2015).
Moreover, both the effort and the geographic extent of pulse fishing are constrained:

- by the number of current licenses, which will not be expanded before a new in-depth research programme is carried out.
- And given that fishing with pulse trawl is only allowed in the ICES divisions IVc and IVb south of a rhumb line joined by the following points, measured according to the WGS84 coordinate system:
  – a point on east coast of the United Kingdom at latitude 55°N
  – east to latitude 55°N, longitude 5°E
  – north to latitude 56°N
  – east to a point on the west coast of Denmark at latitude 56°N

PI 2.4.2.
We consider the main issues of management under this PI to be very similar to Osprey and other demersal fisheries. While we accept that information may be treated differently, we are not convinced that this is appropriate in this case. **SIc** asks for 'some evidence'. We again note the different treatment in the recent Osprey assessment where designation of sites is taken as providing such evidence – this is the same for the pulse fishery.

PI 2.4.3.
It appears entirely appropriate, to be precautionary, to require ongoing research into the locations and effects of pulse trawl on benthic habitats under PI 2.4.3.

PI 2.5.1.
The treatment of ecosystem effects appears inconsistent with MSC guidance and is inconsistent with other assessments of the same species in the same area with similar (demersal trawl) gears. We particularly note that the recent Osprey fishery PCDR terms this 'trophic function'.
MSC guidance GCB 3.1 and 3.1.1 set out the five ecosystem components, with habitats and ecosystem specifically separated, and states "the separation of these components should enable assessments to be focussed on the different objectives and expectations of management…".
The scoring of PI 2.5.1 is significantly lower than for comparable fisheries because of the potential effects on benthic habitats/species. As these are separate objectives of management, we feel that benthic habitats should be considered in PI 2.4.1 only.
The result of the assessment under PI 2.4.1 was that the fishery does not score 80 because of uncertainty over the fished area (see comments on 2.4.1 above).
The scoring of 2.5.1 therefore seems to concentrate on the potential effects on an ecosystem component which has already been scored (more appropriately) in 2.4.1.
We suggest that scoring of PI 2.5.1 should focus on the wider ecosystem effects not already considered. To be consistent with other assessments, this should be the trophic effects of removal of target and bycatch biomass.

Serious or irreversible harm to the ecosystem is interpreted by the MSC (CR v1.3 GCB 3.17) in terms such as:

- (Fishing) "…does not impact the abundance levels of more than 15% of other species and trophic groups by more than 40% and does not reduce the level of any other species or trophic group by more than 70% (a level of effects apparently not achieved for target spp)`
- Trophic cascade caused by depletion of top predators

- Severely truncated size composition of the ecological community to the extent that recovery would be slow due to increased predation by intermediate-sized predators
- Gross changes in species diversity (loss of species, major changes in species evenness).

None of these cases seem to apply to this fishery.

The same section also notes that "relatively few fisheries would have the information needed to address ecosystem effects quantitatively...". Whereas CVO have collected considerable data through monitoring and experimentation.

We particularly note the scoring in the most recent comparable assessment, also undertaken by Acoura, on the Osprey fishery.

2.5.2.
SIc does not address the SG100 requirements. Other fisheries, we note, have addressed this in a different manner. We also note that the measures implemented are based on information directly from the fishery and ecosystem involved.

For **SId** we would contend that the specific information collection and control protocols implemented by CVO more than compensate for the current classification of pulse trawl under 'general trawling (TBB)'?
In addition, the fishery is arguing for the log book registration codes for pulse gear (currently PUK / PUL), which are currently operational in Dutch waters, to be rolled out across the pulse fishing zone. Again, a treatment similar to the Osprey fishery would appear more consistent and appropriate. Given the detailed and specific information collected on pulse fishing, and given that the fishery under this SI otherwise is comparable to other assessments, such as Osprey, there is no reason to be scored differently.

2.5.3.
SIb looks for detailed investigation of some rather peripheral possible effects of the fishery – potential dissolving of toxic chemicals (which have already been introduced into the environment) and effects on early life stages (which has already been investigated and reported).
This seems to go beyond the CR requirements (SG100) that "Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated in detail."(our emphasis).

For **SIc**, impacts on Retained, Bycatch, and ETP species and on Habitats are clearly identified. We accept that they have not been fully quantified, but that is not what the PI asks for. The main functions of these Components in the ecosystem are very well understood, as has also been assessed so for the Osprey fishery. SG100 is met.

For **SId**, the information available is clearly sufficient to allow "some of the main consequences for the ecosystem to be inferred" at least. To not score 100 seems an overly precautionary and conservative approach.

For **SIe**, given the amount of information being collected, it is not apparent why this is not sufficient to "support the development of strategies to manage ecosystem impacts"? Secondly, the argument given that the gear would have to be recognised at EU technical measures level does not appear to relate to the Indicator.

Conditions

Several conditions relate to, or include, a lack of evidence on the effects of the fishery on benthic invertebrates/habitats (Conditions 4, 5, 7, 8, 9, 10) which further illustrates the multiple scoring of a single (potential) ecosystem effect.
One issue is a lack of a time series of information, which CVO/Dutch Authorities have addressed through experimentation – with a very consistent set of outcomes.
The text does not, however, identify what level of information would be sufficient to close these conditions. Without this, the fishery cannot know when conditions could be closed.
In order to create an action plan to deal with the conditions, we have to be consistent with the scoring guidepost wording. Having multiple conditions on the same issue is going to make this very difficult. We argue that conditions should be streamlined and made more relevant to the correct PI's.

PI 1.1.2
ICES re-evaluated the ranges around Fmsy for several stocks and defined the Fmsy-range for plaice to be between 0.13 and 0.27 with an estimated Fmsy value at 0.19. Indeed, as stated in your Client Draft Report the new range is lower than the F estimated in the Management Plan (0.2 – 0.3) for plaice. We are aware the Commission is preparing a new multiannual management plan for demersal fisheries in which the re-evaluated Fmsy-ranges will be included. However, these new Management plans are still being developed and require consultation with Advisory Councils, fishing industry, scientists and other stakeholders having an interest in fisheries management before being implemented. Consequently, advice for plaice is based on the second stage of the existing EU Management Plan (Council Regulation (EC) No 676/2007). Hence, in our opinion PI 1.1.2 should be evaluated according to the existing EU Regulations as is done in other assessments of the same species in the same area. In addition, we note that other fisheries including the Danish and CVO plaice fishery have met SG80. Since the pulse fishery is targeting the same North Sea plaice stock SG80 should be met as well.

In conclusion, we would accept that there are areas where more information is required – notably in relation to PI 2.4.3. We are addressing this already and guidance from the assessment team would be welcomed. However, the repeated scoring of the potential effect on benthic habitats has clearly prejudiced the outcome of the assessment. We therefore ask that the assessment team follow the approach of all other assessments of similar fisheries, especially in relation to PIs 2.5.1-2.5.3.

Appendix 8.2 Acoura Response

Since this is a new type of gear, direct parallels cannot be drawn with traditional demersal trawl gears. Adding electric pulse is in effect a new gear.

We do not think that we have been inconsistent in the scoring, but we have been precautionary, befitting a new gear type, and therefore associated uncertainties.

In the context of this fishery, the distinction between ecosystems and habitats can seem too fine a line, but since we are dealing with a demersal fishery, whereby the gear directly affects the benthos physically (habitat structure) as well as bio-chemically (benthos function as part of the ecosystem), the two are intricately connected. Therefore, to score ecosystem in terms of trophic effects only is not sufficient. Furthermore, Descriptor 4 (Maintaining all elements of marine food webs at normal abundance and diversity) of the Good Environmental Status is the Marine Strategy Framework Directive (2008/56/EC) specifically goes beyond mere trophic foodwebs as part of ecosystem considerations.

The pulse fishery has received special derogation from the EU to fish with pulse which as using electricity for fishing is illegal. As such, the bar should be highly precautionary, and since the derogations were given with more research in mind, one has to see the outcome of such research - which means longer term data collection to detect possible effects that can only be recorded over time rather than one-off experiments on a few species. This has been recognised by the relevant scientists too.

We think the scores given to the various PI's reflects the team's precautionary approach to the pulse fishery.

Regarding condition setting - since the fishery had not achieved the necessary Principle scores to pass, the conditions are written in broad terms. Otherwise it could have been interpreted as telling the client what to do in order to pass. The team can't do that, nor can the they predict the outcome of current research projects, which are still uncertain. By setting clearer timeline conditions, which would need to be closed out, it would assume research outcomes.

Further, regarding the comments on the condition 1.1.2 for plaice the team agree that it is a matter of time and a multiannual management plan for demersal fisheries will be re-evaluated. At the moment 1.1.2 for plaice does not fulfil the requirements under the scoring issue c sg 80 because the current FMSY foreseen in the management plan is above the Fupper estimated by ICES. A management strategy evaluation is needed in order to estimate the risk that biomass fall below Blim in the long term. Until such analysis is provided the PI 1.1.2 cannot score 80. The condition has been harmonised with DFPO and CVO assessments.