

Minutes: *Nephrops* SICA Workshop

Meeting Date: 9th March 2021

Location: MS Teams

Attendees	Organisation
AC: Annika Clements	Ulster Wildlife Trust
BL: Bill Lart	Seafish
CD: Calum Duncan	Scottish Environment Link
CM: Chris McGonigle	Ulster University
CP: Claire Pescod	Macduff Shellfish
EB: Ewen Bell	Centre for Environment, Fisheries and Aquaculture Science
FN: Fiona Nimmo	Poseidon
HS: Hayley Swanlund	WWF-UK
JH: Jan Geert Hiddink	Bangor University
JP: Jo Pollett	Marine Stewardship Council
KC: Kenny Coull	Scottish White Fish Producers Association
MP: Mike Park	Scottish White Fish Producers Association

Apologies from Herriot-Watt University (Mike Kaiser), Marine Scotland Science (Carlos Mesquita), NatureScot (David Donnan), North and East Coast Regional Inshore Fisheries Group (Jennifer Mouat), Orkney Fisheries Association (Hannah Fennell), Queens University Belfast (Patrick Collins), Scottish White Fish Producers Association (Femke de Boer), Tesco (Helena Delgado-Nordmann) and WWF-UK (Abigayil Blandon).

Purpose of the meeting

This workshop brought together experts from the UK *Nephrops* Steering Group and wider field to focus on the Ecosystem component of Principle 2 (P2). Using the Scale, Intensity, Consequence Analysis (SICA) methodology, this workshop was to provide qualitative analysis from experts, in the absence of quantitative evidence, to justify selection of scoring guideposts in the SICA. This is permitted within MSC methodology and Risk Based Framework.

Welcome

FN thanked the group for joining and attendees introduced themselves. An interactive voting system called Mentimeter was prepared for the meeting. The questions from the circulated questionnaire had been uploaded to Mentimeter so the meeting attendees could vote during the meeting for their preferred response as FN went through the questions.

FN described the characteristics of the ecosystem component, which looks at the broad ecological community in which the fishery operates and addresses system-wide issues, such as ecosystem structure, trophic relationships, biodiversity, and community resilience. It does not include considerations of specific habitats or species, which are addressed in other components of the MSC standard and how the group will be assessing the outcome status. She described how the SICA

methodology mimics that of the MSC scoring with criteria to show whether the Unit of Assessment would meet SG60 (a conditional pass), SG80 (best practice) or SG100, and whether there is evidence to support this decision. FN noted that the definition of ‘Serious or irreversible harm’ is whether there could be permanent change to the biodiversity, such as trophic cascade caused by depletion of predators.

The questionnaire circulated prior to the meeting was structured around answering the SICA outcome table and the workshop output will be represented in a table detailing the scores and justifications. FN received three responses to the pre-meeting questionnaire and used those to provide an overview and structure to the discussion. She noted that further responses and discussion are welcome and necessary to bring more confidence to the data, and the references and comments from the three responses will be incorporated into the workshop report.

Presentation of questionnaire results and further discussion

1. Define the geographic area of the ecosystem(s) and specify reason for choice.
 - a. One overall ecosystem for all waters targeted by the fishery
 - b. Three ecosystems: North Sea, West of Scotland, Irish Sea
 - c. More than three ecosystems (by functional unit or other split - please specify)

The MSC methodology working definition of an ecosystem is a broad ecological community and ecosystem in which the fishery operates, such as the ICES Area under assessment. However, there may be scope and justification to split the Unit of Assessment into a number of ecosystems, especially with multiple stocks under assessment across a wide area. The geographic area decided at this point will impact the scores of later questions when considering the overlap of fisheries on a spatial and temporal scale.

FN did not detail responses to the questionnaire. From the nine Mentimeter responses, four voted for *b. three ecosystems*, three for *c. more than three (other split)* and two for *c. more than three (by functional unit)*.

Group discussion

BL felt the variation of exploitation and environment across the functional units would require *c. more than three ecosystem* areas, and further review of different areas’ characteristics is needed to make an informed choice. CD seconded that comment, justifying that as each functional unit is a *Nephrops* ground it makes biogeographic sense to split by functional unit (depending on the degree of population separation). CM voted to split the area into *c. more than three – other split*, and flagged the lack of data to define ecosystem heterogeneity means it is challenging to be predict the extent of impacts. He noted there is a high degree of variability in habitat, structure and depth so recovery potential would vary.

KC felt that functional unit data deficiency may hinder more fine-scale management, so limiting the area to *b. three ecosystems* would be more manageable and realistic. CP voted for *b. three ecosystems* and noted that functional units complement exploitation analysis, whereas ICES divisions may be more appropriate when organising by ecosystem. AC also voted for *b. three ecosystems*, as splitting the Irish Sea and the Clyde – areas recently show to have larval connectivity – may be doing the areas a disservice, though would not recommend simplifying into *a. one ecosystem*. BL would

contrast the hydrography of the Irish Sea and Clyde, to which FN suggested the Clyde could itself be split according to relevant parameters.

FN suggested an initial approach that recognises each functional unit and specific ecosystem attributes within three areas which can be reassessed and split depending on the outcome.

2. What elements of the ecosystem do you think may be affected by the fishery?

Please rank elements 1 to 5, where 1 is most affected and 5 is least affected

- a. **Composition of the species in the ecosystem** - Detectable changes in the identity of species within the ecosystem
- b. **Functional group (for example, plankton)** - Species that share similar suites of traits and provide a similar ecological function or service to the ecosystem
- c. **Distribution of communities** – Change in geographic range of communities which can impact community dynamics
- d. **Trophic structure** – Change in mean trophic level of species within the ecosystem, not specifically target species
- e. **Size structure** – Change in biomass/number in each size class for each species within the ecosystem, not specifically target species
- f. **Other element of the ecosystem (specify)**

3. Which element of the ecosystem do you think is most likely to be affected by the fishery?

Please choose one option - this is likely to align with the element ranked as 1 in Q.2.

Questionnaire responses are in bold.

- a. **Composition of the species in the ecosystem (1 response)**
- b. **Functional group (for example, plankton) (3 responses)**
- c. **Distribution of communities (2 response)**
- d. **Trophic structure (2 responses)**
- e. **Size structure (2 response)**

Questions 2 and 3 were discussed together. Based on the MSC methodology, question 2 is to decide which is the most vulnerable ecosystem sub-component, and is useful to rank in an informal SICA with the expertise of the Steering Group. Responses from the questionnaire prioritised *a. Species composition* and *c. distribution of communities*. The comments for question 2 and 3 stated widespread changes in *b. Species composition* (particularly erect macrofauna) as a result of trawling which will also affect *d. trophic structure*, and marked differences in benthic community distribution (option c) between fished and unfished areas.

For question 2, nine responses to Mentimeter ranked *a. species composition* highest (number of votes per response were not detailed). For question 3, of ten responses to Mentimeter, *b. functional group* received the majority of votes (three), with two votes allocated to *c, d and e* and one for *a. species composition*.

Group discussion

AC said it was difficult to rank the categories as change in one could stimulate change in another and the areas are intrinsically linked, which FN and BL seconded. CM proposed two further aspects to consider when answering. The first considered how endemic diversity within the *Nephrops* functional

units may compare with other units and fisheries. The second considers the degree of ecosystem engineering the biodiversity of each sub-component may accommodate, which influenced his choice of *b. functional group* in question 3.

CP was interested in Cefas's opinion. EB reflected that there are two different recipients of impact (mobile transitory epifauna and sessile infauna) which creates an interesting interfaces and opportunity for impact. On question 3, the options may be rather arbitrary as the sub-components are so highly interlinked, which JH seconded citing *Hiddink et al 2020¹*.and noting an accurate response will be doing without a quantitative analysis. Commenting on the interlinking of sub-components, FN observed *a. species composition* ranked highest in question 2, but was considered it to be the lowest affected sub-component in question 3 amongst a broad range of responses, showing all sub-components are important for this fishery. BL interpreted the broad range as a reflection of the attendees' scope of interest.

CD voted for *option c*, though noted the strong connection with *option a*. CD commented that regular sweeping of the seafloor may prevent development of emergent epifauna, such as sea pens and fireworks anemones. Removal of *Nephrops* also changes the composition of the size class, which then impacts the degree of burrowing and substrate bioturbation and oxygenation. In that scenario this potentially alters the species composition of the burrowed mud.

4. What aspect of fishing activity is most likely to affect the ecosystem?

Please choose one option.

- a. **Fish removal** (i.e. removal of the target species and/or other species caught by the fishery)
- b. **Interaction with the habitat**
- c. **Loss of fishing gear**
- d. **Bait collection** (if relevant to the fishing industry)
- e. **Anchoring gear** (if relevant for fishing)
- f. **Boat mooring** (if relevant for fishing)

The question refers to towed gear (TR1 and TR2). Of 11 responses to Mentimeter, five were for *a. fish removal* and six for *b. interaction with the habitat*. FN did not detail questionnaire responses. CD later commented that he voted for *b. interaction with the habitat* for the same reason he voted *a. species composition* in question 3. He referred to the Marine Directive for 'Good Environmental Status'. He noted that the current distribution of Priority Marine Features (PMF), and more vulnerable burrowed mud sub-components (such as sea pens and anemones) would potentially be affected by fishing pressure.

5. Spatial scale: what is the scale of overlap between the fishery and the element of the ecosystem that is most likely to be affected by it?

Please select one option based on your expert judgement.

¹ Hiddink, J.G., Kaiser, M.J., Sciberras, M., McConnaughey, R.A., Mazor, T., Hilborn, R., Collie, J.S., Pitcher, R., Parma, A.M., Suuronen, P., Rijnsdorp, A.D., and Jennings, S. 2020. Selection of indicators for assessing and managing the impacts of bottom trawling on seabed habitats. *Journal of Applied Ecology* 57: 1199-1209.

- a. Less than 1% overlap
- b. 1-15% overlap
- c. 16-30% overlap
- d. 31-45% overlap
- e. 46-60% overlap (1 response)
- f. Over 60% overlap (2 response)

The VMS data is from 2017 demersal otter trawls targeting *Nephrops*. Rationale from the questionnaire for e. 46-60% was fishery overlap with subtidal mud habitats and variation between functional units in species mortality from interaction with fishing gear. F.60-100% was related to the fishable elements of the ecosystem, rather than the ecosystem as a whole. Of 10 responses to Mentimeter, two were for each of d. 31-45% and e. 46-60%, and six for f. over 60%.

Group discussion

To obtain the data on <15m vessels EB advised FN to request that from the MMO, and that Cefas' GIS team may have a contact. CP added she has two MMO contacts who can provide FN data from 2019/20, which FN greatly appreciated. JH has used 2018 data in current research ICES which shows a high degree of overlap from the data. The information is pending publication. AC seconded this with a caveat; there would be a high degree of overlap in the Irish Sea due to a high proportion of mud habitat. However, there would be a lesser degree of overlap if using a sub-component with a larger scale such as species composition or removal. CP seconded this reflection.

KC voted d. 31 – 45% due to the varying scale at the different functional units within ecosystems are used. CM thought JH and AC comments were very useful, raised the need to define “ecosystem” in this context as the workshop has shown the variety of potential interpretations of the term. This will need clarifying if a habitat-based management approach is adopted. EB added functional units are described in terms of ICES rectangles as that is the scale at which catches are reported, but *Nephrops* are only caught within the mud patches, so there is a conflict there on which functional unit is being discussed. FN reminded the group of the working definition of an ecosystem is the area in which the fishery operates, such as the ICES Area under assessment

CD voted for f. over 60% as the *Nephrops* fishery aligns closely with the burrowed mud PMF and functional units. AC noted she only responded in terms of the Irish Sea in the questionnaire and flagged the great literature available, and be mindful if we are looking at seabed-based recovery or the wider-ecosystem, and that there is some interesting modelling available. BL seconded this.

Action: FN/CP to contact MMO for data on <15m vessel fishing activity from 2018 to present.

6. Time scale: how often does the fishery interact with the element of the ecosystem that is most likely to be affected by it?

Please select one option based on your expert judgement.

- a. 1 day every 10 years or so
- b. 1 day every few years
- c. 1-100 days per year
- d. 101-200 days per year
- e. 201-300 days per year
- f. 301-365 days per year

FN noted options *d* and *e* were selected in the questionnaire but did not give further detail. The seven responses to Mentimeter were three votes for *c.1- 100 days*, two for *d.101-200 days* and two for *f.301-365 days*. The scallop SICA workshop the week before suggested converting VMS data into fishing hours rather than days, though how a day is defined may vary. Eight hours of active fishing a day equates 1000 fishing hours to 125 days; six hours equates to 167 days; five hours equates to 200 days and four hours equates to 250 days. FN added the multiple vessels may be fishing in the same location.

Group discussion

JH suggested using the annual fishing frequency of a piece of seabed (the swept area ratio) as a more relevant measure than fishing hours for interaction. The ratio is calculated by dividing the number of square kilometres fished by cell area; if the ratio is above 1 then the whole cell has been fished and the calculation is based on fishing hours and gear used. He voted for *d. 1-100* because the average swept area ratio of *Nephrops* beds is highly variable between areas. FN agreed this sounded informative and conclusive, and BL seconded JH's comments.

CD voted for *e. 201-300 days* on the assumption that while some cells may only be trawled a few times, a majority of suitable muddy grounds would be swept in pursuit of *Nephrops*. One pass of the gear could be enough to remove emergent vulnerable epifauna. KC voted *d.101-200 days* for the Clyde due the small fleet in operation, but estimated that North Sea would account for more than 200 days as while fewer in number, they can work longer. EB agreed that interactions will be highly specific according to functional units and that in some areas there are many vessels are under 12m so will not be included in VMS data, thus requiring assumptions on quite a large proportion of fleet fishing activity. FN thought a specific piece of work on this, taking into consideration how <12m vessel activity is assessed, would be of use.

Action: FN to review how <12m vessel activity in functional units can be more accurately calculated.

7. Intensity: How intense is the interaction of the fishing industry with the element of ecosystem that is most likely to be affected by it?

This relates to the element identified in Q.3. Please select one option based on your expert judgement.

- a. **Negligible** - Remote probability of the effect of the activity detected at any spatial scale or temporary
- b. **Minor** – Minor activity occurs rarely or in some restricted places, and evidence of activity even at these scales it is rare
- c. **Moderate** - Moderate activity detection on a wider spatial scale or obvious detection but local
- d. **Major** - The detectable evidence of activity occurs reasonably often on a broad spatial scale
- e. **Severe** - Easily detectable localized evidence of activity and widespread and frequent evidence of activity
- f. **Catastrophic** Local or regional evidence of activity or continuous and widespread evidence

FN noted the response will vary across functional units. The questionnaires highlighted there is evidence of cause and effect across the ecosystem. Of nine responses to Mentimeter, two were for *c. Moderate*, six for *d. Major* and one for *e. Severe*. FN recognised how interlinked the questions are in terms of ecosystem, and reminded the group that *Nephrops* would need to harmonise with the MSC certified Joint Demersal Fishery scores. That fishery scored 90 in their ecosystem assessments, and considered the entire on North Sea as the ecosystem for all fisheries being assessed regardless of fishery and gear type.

Group discussion

JH opened the discussion by highlighting evidence of impacts on ecosystem sub-components from *Rijnsdorp et al 2020*². The study found that 10% of non-target benthic invertebrates are removed after towing a nephrops trawl over a piece of seabed, which is slightly higher removal than after fish otter trawl and about half the removal seen from a scallop dredge. EB added it's rare not to see flattening or gauging of the seabed from underwater footage from twin riggers, the impacts of which can be quite substantial. CD voted *e. Severe*, though noted that it depends on the status of the ground. If already swept, and on multiple occasions, this is very different to a previously untouched area of rich burrowed mud community with for example dense Fireworks anemone stands or a tall sea pen forest. The severity depends on the current status of the ground, again overlapping with the Good Environmental Status point that habitats should be able to exist across their range.

8. Consequence: what do you think are the consequences of the impact of the fishery on the aspect of the ecosystem most likely to be affected?

This relates to the element identified in Q.3. Please see Annex A for further guidance on justifications relevant for each option.

- a. Interactions are unlikely to be detectable against natural variation (SG100)
- b. Interactions are likely to cause up to 5% change in characteristic; impact recovery is likely to take up to 5 years. (SG80)
- c. Interactions are likely to cause up to 10% change in characteristic; impact recovery is likely to take up to 20 years. (SG60)
- d. Interactions are likely to cause greater than 10% change in characteristic; impact recovery is likely to more than 20 years (Fail – option not included in questionnaire)

Comments from the questionnaire noted the longer term impacts on seabed sediments due to bottom-contacting gear; that there is large variation between functional units; other fisheries operating may impact trophic levels; and heterogeneity in energetics and natural disturbance could indicate the rates of change and recovery. Of nine responses to Mentimeter, one voted for *b. up to 5%*, seven for *c. up to 10%* and one for *d. more than 10 yrs.*

Group discussion

CD commented that in context of JH's data, removal also depends on the type of biota. Theoretically 10% of all biota could include a large percentage of the most vulnerable epifauna. JH clarified data from *Rijnsdorp et al 2020*² are based on in- and epifauna and have done separate estimates, finding

² Rijnsdorp, A.D., Hiddink, J.G., Denderen, P.D.v., Hintzen, N.T., Eigaard, O.R., Valanko, S., Bastardie, F., Bolam, S., Boulcot, P., Egekvist, J., Garcia, C., Hoey, G.v., Jonsson, P., Laffargue, P., Nielsen, J.R., Piet, G.J., Sköld, M., and Kooten, T.v. 2020. Different bottom trawl fisheries have a differential impact on the status of the North Sea seafloor habitats. *ICES Journal of Marine Science* 77: 1772–1786.

trawl passes are higher on previously trawled ground. JH offered to provide the supporting papers (*Sciberras et al 2017*). BL felt the combination of time scale and recovery time challenging to score as they may not apply to all impacts. FN advised BL to be precautionary, selecting the option where the subcomponent falls into the higher response clause stated.

Next steps

FN will collate any further questionnaire responses and comments; write up workshop findings which will go into a written report. She invited participants to submit any further comments, references or sources of information either within the questionnaire or in an email. FN will review the research and links provided and convert that into an MSC score. There will be further consideration for action plan milestones which will be brought to the next Steering Group meeting. All workshop attendees will be updated on the findings, including those that sit outside the Steering Group.

Action: All are invited to provide FN with any further comments and references

Meeting Closes

The meeting closed at 11:24. Draft minutes will be circulated to the participants of the meeting for feedback and then uploaded to the Project UK website and FisheryProgress.org.

Actions

Actions Arising		Responsibility
1	Contact the MMO to ask for data on <15m vessel fishing activity from 2018 to present.	FN/CP
2	Review how <12m vessel activity in functional units can be more accurately calculated	FN
3	Provide FN with the two supporting papers noted in Questions 3, 7 and 8.	JH
4	Send any additional comments or references to FN by email.	All