



**Analysis of data pertaining to Sea-pen and burrowing megafauna
communities in East of Haig Fras MCZ**

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Background

Sea-pen and burrowing megafauna communities is a habitat Feature of Conservation Interest (FOCI) for Marine Conservation Zones in England. The feature is defined using the OSPAR definition of plains of fine mud between 15-200m deep “...*which are heavily bioturbated by burrowing megafauna with burrows and mounds typically forming a prominent feature of the sediment surface...*” ([OSPAR 2010](#)). JNCC has developed additional guidance for defining the habitat to support work on English MCZs which should be used when classifying Sea-pen and burrowing megafauna communities. This proposes that while burrowing megafauna are essential, sea-pens may or may not be present and the feature can occur in both sandy or fine muds (JNCC 2014).

In 2015 a JNCC monitoring survey visited the designated East of Haig Fras MCZ and collected video and grab data. The presence of Sea-pen and burrowing megafauna communities was noted during the survey and as a result was proposed as a potential new feature of the site as part of the Tranche Three MCZ nominations being considered by Defra for designation in 2019. The initial analysis of the video data post-survey noted whether burrows were present on video or stills (Callaway 2015), but no quantitative or qualitative assessment of burrow density was undertaken, preventing an assessment of the presence and extent of Sea-pen and burrowing megafauna FOCI.

In 2016 an analysis was undertaken on a subset of tows to confirm the presence of Sea-pen and burrowing megafauna communities within the site which informed JNCC’s pre-consultation scientific advice on this feature within East of Haig Fras MCZ. This analysis of survey data provided the initial evidence needed to confirm feature presence, however for JNCC to provide more comprehensive scientific advice on the extent of the proposed feature to support its designation, further analysis was needed. As such, in 2018, further analysis of video tows was undertaken to improve confidence in the presence and extent of the feature and provide further evidence to support the designation of the Sea-pens and burrowing megafauna communities as a protected feature within East of Haig Fras MCZ.

Method

The objective of the 2018 analysis was to improve our confidence in the extent of the habitat FOCI throughout East of Haig Fras MCZ. The methodology was predominantly based on a combination of the guidance provided within the JNCC paper providing clarification on the

habitat definition (JNCC 2014) and the approach taken to analyse the data initially in 2016 to confirm habitat FOCI presence for the purposes of JNCC's pre-consultation scientific advice.

To confirm the habitat presence, video data is ideally needed to undertake burrow counts, along with results from infaunal analysis and particle size analysis (PSA) (JNCC 2014). Where only video data is available, burrow numbers must be frequent or higher on the SACFOR abundance scale¹ to qualify as the Sea-pen and burrowing megafauna FOCI.

Prioritisation approach

Due to time constraints, not all video transects were analysed. Priorities were assigned to sections of videos depending on the set of criteria listed below, which were based on the PSA, video and still analysis results already undertaken on the 2015 survey data as part of the survey deliverables. A grab sample was not collected at all video stations, which is reflected in the prioritisation categories below. Each broadscale habitat segment of the video transect was prioritised separately, but videos were analysed as a whole rather than being segmented by habitat. As such, if a section within a video qualifies as high priority all lower priority sections within this tow were included in the analysis. The video transects containing sections with the highest priorities were considered to have the highest potential for presence of the habitat FOCI.

The priorities were assigned in the following way with 1 being the highest priority:

1. PSA result shows subtidal mud present;
2. Video analysis shows subtidal mud present, and there is either no PSA or the PSA indicates the sediment is Subtidal coarse, sand or mixed sediments;
3. PSA result shows subtidal sand is present;
4. Video analysis shows subtidal sand present but no PSA taken at that station;
5. Video analysis shows subtidal sand present but PSA suggests sediment is coarse or mixed;
6. PSA result shows subtidal mixed sediments present;

Videos which fell into priorities 1 to 4 were included in the analysis but time did not allow for the videos containing only segments that fell into priority categories 5 and 6. Following this

¹ SACFOR: S = Superabundant, A = Abundant, C = Common, F = Frequent, O = Occasional, R = Rare. More information on the JNCC website here: <http://archive.jncc.gov.uk/default.aspx?page=2684>

prioritisation approach, 77 out of 138 video tows were analysed for the presence of Sea-pen and burrowing megafauna communities.

Analysis methodology

The video transect shapefile from the survey was analysed to assess the length of each transect tow. This information was then combined with the video length information to divide the videos into time periods representing 5m sections. Where burrows were identified in a section, the videos were slowed to at least half speed (dependent on image quality), to allow for a more accurate count. The number of burrows larger than 3cm in diameter and less than 3cm in diameter were recorded separately as these size categories have different density threshold values on the SACFOR scale. The distance between the laser pointers in the videos (17cm) was used as an indicator to judge burrow size.

Recording was undertaken using a burrow recording form that takes the transect length (m) and video length (mm:ss) and automatically calculates the duration (in seconds) of a 5m section for analysis of burrow density. The density of burrows (m⁻²) in the two size categories was calculated for each section according to the following formula:

$$Density = \frac{\text{number of burrows in a section}}{\text{length of section (m)} * \text{width of section (m)}}$$

Although the length of most sections was 5m the final section in each analysis was often shorter due to irregular transect lengths. The recording form calculated the length of each section given the total transect length and start and end times of the section, and input this into the density calculation. An average measurement of video width was used when calculating density.

Following the 2016 methodology a precautionary approach was followed when identifying if the feature was present. The threshold of 0.2m⁻², used for *Nephrops* stock assessment data, was adopted for the identification of feature presence for burrows larger than 3cm. A threshold of 2m⁻² was used for assessing presence of burrows measuring less than 3cm. If densities suggested that burrows were at least frequent on the SACFOR abundance scale, for one or more of the size categories, the habitat was considered present within a 5m² section of transect. This provided a higher resolution of habitat FOCl extent than previously available.

Results

Of the 77 transects analysed, 42 of them included 5m sections which were identified as the Sea-pen and burrowing megafauna communities habitat FOCI. This equated to 179 sections that were identified as positive records for the habitat FOCI. The habitat FOCI were more concentrated in the northern half of the site (137 of 179). In the centre there is a large patch where no samples of the habitat FOCI were recorded. A concentration of positive records in the east corresponds to the area of the site where the greatest number of video tows were taken. There are relatively fewer records in the far west as a greater proportion of this area was not covered by video tows. Overall there is an uneven spread of habitat FOCI records across the site, however this is partly due to the entire site not having video tow data.

Quality assurance

As this analysis informed JNCC's formal scientific advice to Defra, it was deemed necessary to establish both an internal and external quality assurance (QA) process.

Internal quality assurance

The internal QA of the analysis outputs was undertaken first by the JNCC observers who undertook the analysis. Of the videos originally analysed by each observer, 10% were randomly selected and allocated to a different observer to reanalyse. The reanalysed results were compared with the original and any major disparities were investigated.

There were some differences between the total number of burrows recorded for the same video between observers. Reasons for the differences are likely to be similar to those in the 2016 analysis; observer error relating to misidentification of burrows (e.g. counting shadows), burrow size and what constitutes a burrow complex. Size and resolution of screen could also cause minor differences. Despite differences in the number of burrows counted, observer results generally agreed on whether burrows were present (transect presence/absence point agreement 81% on average).

External quality assurance

The external QA was contracted out to Cefas (Hawes 2018). Cefas were requested to perform the analysis on 10% of the analysed video tows, which were randomly selected and to compare their results against those of the original JNCC observers using the Bray-Curtis similarity index. A grade was applied to each video tow (Excellent match – Poor match) and

any comparisons which scored below an acceptable match were investigated further. There was a generally high-level of agreement between the initial and the QA analysis, with an average Bray-Curtis similarity score of 79.11%. Of the eight tows analysed two scored below an acceptable match, however only one was significantly below the threshold and required further investigation. This result was analysed further in house. The feature presence conclusions for each section were compared and there was good agreement (transect average 87% agreement) between the externally QA'd results and the original results.

Conclusions

As both the internal and external QA processes didn't identify any significant issues with the analysis, JNCC concluded that 179 sections of video were confirmed as records of Sea-pen and burrowing megafauna communities. These data were then used to inform the presence and extent assessments for this feature within East of Haig Fras MCZ for JNCC's post-consultation scientific advice.

References

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