



**JNCC clarifications on the habitat definitions of two habitat
Features of Conservation Importance:**

- **Mud habitats in deep water, and;**
- **Sea-pen and burrowing megafauna communities**

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1 Introduction

This paper has been prepared as the Joint Nature Conservation Committee's (JNCC) advice to clarify the definitions of two habitat Features of Conservation Importance (FOCI), as listed in the Ecological Network Guidance (ENG) (Natural England and JNCC, 2010) for the Marine Conservation Zone (MCZ) project.

For the MCZ project, JNCC and NE recommended that 22 habitat FOCI should be protected within MPAs. Each of these habitats was identified from the OSPAR list of threatened and/or declining species and habitats (herein referred to as OSPAR habitats) and/or the UK list of Priority Species and Habitats (UK Biodiversity Action Plan) (herein referred to as BAP habitats).

All habitat FOCI are synonymous with the OSPAR and BAP habitats and their definitions exactly match those from the [OSPAR Agreement 2008-07](#) and the [UK BAP Priority Habitat Descriptions](#).

In order to maintain consistency in classifying habitat FOCI for the MCZ evidence gathering programme in UK waters, clarification on some of the habitat definitions were deemed to be needed. Whilst the formal definitions will not be changed, this paper provides recommendations on how to classify the habitat based on these definitions. This paper focuses on the two habitat FOCI:

- Mud habitats in deep water; and,
- Sea-pen and burrowing megafauna communities.

These two habitat FOCI also have similarities to some of the Priority Marine Features (PMF) and MPA Search Features in Scottish waters. Whilst any relationships have been outlined in this document, this paper focuses primarily on classifying habitat FOCI.

2 Mud habitats in deep water

2.1 Formal definition

This habitat is defined using the [UK BAP description](#):

“Mud habitats in deep water (circalittoral muds) occur below 20-30m in many areas of the UK's marine environment, including marine inlets such as sea lochs. The relatively stable conditions associated with deep mud habitats often lead to the establishment of communities of burrowing megafaunal species where bathyal species may occur with coastal species. The burrowing megafaunal species include burrowing crustaceans such as Nephrops norvegicus and Callinassa subterranea. The mud habitats in deep water can also support seapen populations and communities with Amphiuira spp”.

2.2 Environmental factors

- Deep water is defined as circalittoral waters into the deep-sea. The circalittoral zone is generally considered to start from the depth limit of kelp growth, where approximately 1% surface light reaches the seabed.
- Whilst deep-sea is not explicitly stated in the BAP definition, the habitat encompasses the ‘Sea-pen and burrowing megafauna communities’ habitat FOCI which is known to occur in deep-sea environments. As such JNCC interprets the definition of ‘Mud habitats in deep water’ to include deep-sea biotopes.
- Furthermore, the ‘deep water’ element of the ‘Mud habitats in deep water’ habitat also relates to the stability of the environment. Only low energy (where wave and tidal current action is low) environments representing ‘stable conditions’ are considered in this habitat type.
- Based on the BAP definition, this habitat is typically found from about 20m depth onwards. It can be found in open coast (typically from about 20m) and sheltered, fully saline environments such as sea lochs and voes (typically from about 15m, although has been found to occur shallower - for example it is known to occur at approximately 7m depth in Loch Sween (S. Cunningham (Scottish Natural Heritage), *pers.comms*, 2014)).
- Whilst this habitat type has been known to occur in highly modified conditions such as harbours (N. Lough, Natural Resources Wales, *pers.comms.*, 2014.), these would generally not be classified as BAP and FOCI habitats, although areas with a lower level of modification should be considered on a case-by-case basis.

2.3 Biology and biotopes

- Within the EUNIS habitat classification, the biotope complexes provided in Table 1 may be a component part of ‘Mud habitats in deep water’.
- The lower EUNIS level (Level 5 and 6) biotopes associated with these biotope complexes are also considered to be a component part of this habitat. For suggested biotopes, see the JNCC [correlation table](#) between the habitat classifications and the ‘Mud habitats in deep water’ BAP habitat.
- There is not a direct relationship between the habitat classification biotopes and ‘Mud habitats in deep water’, because the classifications are not exhaustive so gaps in, and variants of, biotopes are known to occur. As such, these biotopes **do not**

exclusively represent ‘Mud habitats in deep water’. However if different biotopes are sampled which are thought to represent the habitat, additional supporting data such as seabed imagery would be needed before these could be classified as this habitat.

- The [BAP description](#) clarifies the types of species which may be found in this habitat. Further species included in this habitat are detailed in the individual biotope descriptions representative of the habitat (see the JNCC [correlation table](#) to the habitat classification for representative biotopes).

Table 1 – Biotope complexes that may be a component part of ‘Mud habitats in deep water’

EUNIS code	Britain and Ireland classification code	Biotope complex	Comment
A5.34	SS.SMu.IFiMu	Infralittoral fine mud	Only relevant for shallow, sheltered habitats such as sea lochs and voes
A5.35	SS.SMu.CSaMu	Circalittoral sandy mud	Includes A5.351, A5.352, A5.353, A5.354, A5.3541, A5.355
A5.36	SS.SMu.CFiMu	Circalittoral fine mud	Includes A5.361, A5.3611, A5.362 and A5.363
A5.37	SS.SMu.OMu	Deep/Offshore circalittoral mud	Includes A5.371, A5.372, A5.373, A5.374, A5.3741, A5.375, A5.376, A5.377 and A5.7211
A6.5	N/A	Deep sea mud	This will include component biotope complexes and biotopes being developed in the revised deep sea classification (to be confirmed).

2.4 Overlaps with other habitat types

- It is generally considered that the relationships detailed in Tables 2 and 3 occur between ‘Mud habitats and deep water’ and other listed habitats, although exceptions can occur.

2.5 Sampling techniques and data analysis

- If Particle Size Analysis (PSA) has not been undertaken, data from video/still images and/or infaunal grab samples which include faunal communities indicative of a well established ‘stable’ mud or sandy mud dominated sediment can be assigned as ‘Mud habitats in deep water’. However, depending on the species present, it may not be possible to classify the associated broad-scale habitat (e.g. Subtidal mud) without PSA data.

- Where data indicate the presence of the habitat FOCI 'Sea-pen and burrowing megafauna communities', then this more detailed habitat should be classified, rather than 'Mud habitats in deep water'. The presence of the 'Sea-pen and burrowing megafauna communities' habitat is usually enough to confirm that 'Mud habitats in deep water' is also present.
- However, where the 'Mud habitats in deep water' habitat extends further than the 'Sea-pen and burrowing megafauna communities' habitat, the data analysis should classify this transition into 'Mud habitats in deep water'.

Table 2 – Relationship between 'Mud habitats in deep water' and other listed habitats.

Listed habitat	Type of habitat	Relationship	Broad-scale listed habitat	Type of habitat
Mud habitats in deep water	UK BAP and Habitat FOCI	Contains	Sea-pen and burrowing megafauna communities	OSPAR Threatened & Declining and Habitat FOCI
			Burrowed mud	Scottish PMF and MPA Search Feature
			Inshore deep sea mud with burrowing heart urchins	Scottish PMF and MPA Search Feature

Table 3 - Relationship between 'Mud habitats in deep water' and listed 'broad-scale' habitats.

Listed habitat	Type of habitat	Relationship	Broad-scale listed habitat	Type of habitat
Mud habitats in deep water	UK BAP and Habitat FOCI	Contained within	Subtidal mud	MCZ Broad-scale
			Deep sea bed	MCZ Broad-scale
			Offshore deep sea mud	Scottish PMF and MPA Search Feature

3 Sea-pen and burrowing megafauna communities

3.1 Formal definition

This habitat is defined using the [OSPAR definition](#):

*“Plains of fine mud, at water depths ranging from 15-200m or more, which are heavily bioturbated by burrowing megafauna with burrows and mounds typically forming a prominent feature of the sediment surface. The habitat may include conspicuous populations of sea-pens, typically *Virgularia mirabilis* and *Pennatula phosphorea*. The burrowing crustaceans present may include *Nephrops norvegicus*, *Calocaris macandreae* or *Callianassa subterranea*. In the deeper fiordic lochs which are protected by an entrance sill, the tall seapen *Funiculina quadrangularis* may also be present. The burrowing activity of megafauna creates a complex habitat, providing deep oxygen penetration. This habitat occurs extensively in sheltered basins of fjords, sea lochs, voes and in deeper offshore waters such as the North Sea and Irish Sea basins”.*

3.2 Interpretation of the definition

- In 2011 an OSPAR workshop took place in Bergen, Norway to improve the definitions of habitats on the OSPAR list. A number of recommendations were made and formal amendments to the OSPAR definition document (OSPAR Agreement 2008-07) will be made through the work of the OSPAR Biodiversity Committee in agreement with all Contracting Parties.
- Whilst these formal amendments have yet to be formally agreed by the OSPAR Commission, JNCC have used some of these recommendations to inform the clarifications in this document. However, this advice is subject to change and this clarification document will be updated should any further amendments be made.
- JNCC suggest the following recommendations from the OSPAR workshop are used when classifying Sea-pen and burrowing megafauna communities:
 - Burrowing megafauna is an essential element of the habitat but sea-pens may, and by extension may not, be present.
 - The habitat depth is modified to ‘subtidal’ in order to account for shelf and deep sea examples.
 - The relevant biological communities may sometimes be found on sandy muds as well as fine muds.
 - *Funiculina quadrangularis* can be found in areas other than just fjordic sea lochs.
 - Deeper water species such as *Kophobelemnion stelliferum* and *Umbellula encrinus* are included in the definition.

3.3 Environmental factors

- Based on the OSPAR definition, this habitat is typically found from about 15m depth down to the deep sea. It can be found in open coast (typically from about 20m) and sheltered, fully saline environments such as sea lochs and voes (typically from about 15m, although has been found to occur shallower).
- JNCC interprets the OSPAR definition to mean that sea-pens may or may not be present. This is particularly relevant in areas of seabed where sea-pens may have

previously existed but have been removed by anthropogenic activity. Therefore, any burrowed areas of mud would be deemed to be ‘Sea-pen and burrowing megafauna communities’, regardless of whether sea-pens are seen/sampled.

- Whilst sea-pens do not need to be present, the habitat does need to include multiple burrows or mounds from associated megafauna. (Ref – the [OSPAR agreement](#) notes that the habitat is ‘*heavily bioturbated by burrowing megafauna with burrows and mounds typically forming a prominent feature of the sediment surface*’).
- The habitat occurs predominately in fine mud sediments. However some examples of this habitat have been identified in areas of sandy muds. As such, where there is clear evidence of the relevant biological assemblages (burrowing megafauna and in some examples, sea-pens), such habitats can be classified as ‘Sea-pen and burrowing megafauna communities’ regardless of the grain size composition of the sediment.
- The definition extends further than the habitat classification biotope ‘Sea-pens and burrowing megafauna in circalittoral fine mud’ since additional biotopes are also considered to be associated with the habitat (see below).

3.4 Biology and biotopes

- Within the EUNIS habitat classification, the biotope complex and biotopes provided in Table 4 may be a component part of ‘Sea-pen and burrowing megafauna communities’.
- There is not a direct relationship between the habitat classification biotopes and ‘Sea-pen and burrowing megafauna communities’, because the classifications are not exhaustive so gaps in, and variants of, biotopes are known to occur. As such, these biotopes **do not exclusively represent** ‘Sea-pen and burrowing megafauna communities’. However if different biotopes are sampled which are thought to represent the habitat, additional supporting data such as seabed imagery would be needed before these could be classified as this habitat.
- Care should be taken in identifying relevant biotopes. For example, a sample of the biotope A5.354 “*Virgularia mirabilis and Ophiura spp. with Pecten maximus on circalittoral sandy or shelly mud*” could be misidentified as ‘Sea-pen and burrowing megafauna communities’ due to the presence of *Virgularia* sea-pens. However this biotope lacks burrowing megafauna and this should direct users **not** to classify the sample as ‘Sea-pen and burrowing megafauna communities’
- This habitat is also known to occur in deeper offshore waters such as the North Sea and Irish Sea basins. As such, deep-circalittoral variants of the circalittoral mud biotopes detailed in Table 4 would be considered a part of this habitat. Furthermore, mud biotope complexes and biotopes being developed in the revised deep sea classification will be considered a component of this habitat since the habitat is defined to include “*a range of communities and biotopes stretching from Scottish sea lochs to the abyssal plain*” (OSPAR, 2010).
- The [OSPAR background document](#) clarifies the types of species which may be found in this habitat. Further species included in this habitat are detailed in the individual biotope descriptions representative of the habitat (see the JNCC [correlation table](#) to the habitat classification for representative biotopes).

Table 4 – Biotope complexes and biotopes that may be a component part of ‘Sea-pen and burrowing megafauna communities’.

EUNIS code	Britain and Ireland classification code	Biotope complex
A5.36	SS.SMu.CFiMu	Circolittoral fine mud
A5.35	SS.SMu.CSaMu	Circolittoral sandy mud <i>(only if the relevant biological communities are associated with this sediment type)</i>
A5.361	SS.SMu.CFiMu.SpnMeg	Sea-pens and burrowing megafauna in circolittoral fine mud
A5.3611	SS.SMu.CFiMu.SpnMeg.Fun	Sea-pens, including <i>Funiculina quadrangularis</i> , and burrowing megafauna in undisturbed circolittoral fine mud
A5.362	SS.SMu.CFiMu.MegMax	Burrowing megafauna and <i>Maxmuelleria Lankesteri</i> in circolittoral mud

3.5 Overlaps with other habitat types

- This habitat has similarities with habitats on other conservation lists as follows (Tables 5 and 6):
 - ‘Sea-pen and burrowing megafauna communities’ are **contained within** the habitat FOCI ‘Mud habitats in deep water’. The latter has a slightly broader definition than the former, including **all** biotopes in circolittoral sandy mud (SS.SMu.CSaMu) and offshore circolittoral mud (SS.SMu.OMu).
 - ‘Sea-pen and burrowing megafauna communities’ are **contained within** the Scottish PMF and Search Feature ‘Burrowed mud’. The latter has a slightly broader definition than the former, including the fireworks anemone *Pachycerianthus multiplicatus* as a specific component of the habitat (SNH, 2014).

Table 5 - Relationship between ‘Sea-pen and burrowing megafauna communities’ and other listed habitats.

Listed habitat	Type of habitat	Relationship	Listed habitat	Type of habitat
Sea-pen and burrowing megafauna communities	OSPAR T&D and habitat FOCI	Contained within	Mud habitats in deep water	UK BAP and habitat FOCI
			Burrowed mud	Scottish PMF and MPA Search Feature

Table 6 - Relationship between ‘Sea-pen and burrowing megafauna communities’ and listed ‘broad-scale’ habitats.

Listed habitat	Type of habitat	Relationship	Broad-scale listed habitat	Type of habitat
Sea-pen and burrowing megafauna communities	OSPAR T&D and Habitat FOCI	Contained within	Subtidal mud	MCZ broad-scale
			Deep sea bed	MCZ broad-scale
			Offshore deep sea mud	Scottish PMF and MPA Search Feature

3.6 Sampling techniques and data analysis

- The key aspect in identifying this habitat is the ability of the sampling approach to clearly identify the relevant biological components of the feature.
- To confirm this habitat type the following data are ideally required:
 - Video and stills imagery to confirm burrows and/or mounds and, where present, sea-pens;
 - Infaunal grab samples to confirm relevant fauna; and,
 - PSA data to confirm a fine mud habitat.
- If only one or two data types are available the following guidance should be used to classify ‘Sea-pen and burrowing megafauna communities’:

Video/stills only

- Multiple sightings of burrows and/or mounds attributable to relevant species across a video tow or in a sufficient number of still images to identify the burrows and/or burrowing species as at least frequent on the [SACFOR scale](#). This scale provides density estimates for each abundance class which could be used when analysing video or stills imagery data (for example, for species 3-15cm in size, there should be 1-9 species per 10m² to be classed as frequent on the SACFOR scale).
- Depending on the burrowing species, indicated by the species presence or burrow type, it may not be possible to classify the associated broad-scale habitat (e.g. Subtidal mud) without PSA data as some species are not specific to one substrate type. Due to the difficulties of identifying species from burrow type and the evolving nature of relevant ID guides, a degree of caution should be applied where identification of species is based on burrow type alone.

Infaunal grab samples only (no video or poor quality video)

- Fauna representative of mud dominated sediments as well as species known to produce ‘gallery burrow systems’ in conjunction with PSA samples to confirm the mud sediment type. However, burrowing species should be in sufficient numbers to be identified as at least frequent on the [SACFOR scale](#).
- Video and photographic data from *Nephrops* stock assessments have been considered by ICES as a possible tool to derive semi-quantitative abundance data on ‘Sea-pen and burrowing megafauna communities’ to assess the status of this habitat

(ICES, 2011). As such JNCC consider that video data are sufficient to be able to identify this habitat if relevant biological evidence (burrows attributable to relevant species / genera or the species themselves) are clearly visible in the images).

- The fauna responsible for creating the burrows can include, but are not limited to, *Nephrops norvegicus*, *Calocaris macandreae* or *Callianassa subterranea*. Other burrowing megafauna and a guide to the identification of their burrows can be found in the ICES guidance document “Protocols for assessing the status of sea-pen and burrowing megafauna communities” (ICES, 2011). A simple guide for sea-pen identification from videos is also provided in Annex I of this document. It should be noted however, that this guidance document does state that both burrow and sea-pen ID guides require QA testing and calibration prior to incorporation into a protocol; thus it is recommended these materials are only used with a degree of caution until such testing has taken place.

3.7 Anthropogenically impacted habitats

- The consequence of abrasion pressure can be a confounding factor in the identification of ‘Sea-pen and burrowing megafauna communities’. There is evidence suggesting reduced populations of sea-pens and some burrowing species in heavily abraded conditions (OSPAR, 2010).
- ICES (2011) indicates that in the development of methods to assess the status of ‘Sea-pen and burrowing megafauna communities’ using data from *Nephrops* video surveys “Further research is needed to establish a better understanding of the relationship between local densities [of the biological communities] and overall status, in particular as sampling would be carried out in areas impacted by *Nephrops* fishing and hence [would be] potentially different from unfished areas or those exploited by fishing gear other than those used for *Nephrops*”. As such, it seems the impact of abrasion on these habitats cannot yet be fully quantified, but it is a known pressure.
- The identification of this habitat FOCI in impacted areas can therefore be difficult. However, JNCC consider that where burrowing megafauna are present, whether seen in image data or grab samples, then these areas can be classified as ‘Sea-pen and burrowing megafauna communities’. For example, *Nephrops* grounds could be classified as this habitat, albeit they could be degraded examples if subject to significant abrasion pressure over time.

4 References

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Appendix 1: Version control

BUILD STATUS:

Version	Date	Author	Reason/Comments
1.0	27/06/14	Laura Robson	Final version for release
0.5	19/06/14	Laura Robson	Further edits following comments from NE
0.4	19/05/14	Laura Robson	Edits following comments from SNCB and agency peer review
0.3	15/04/14	Laura Robson	Edits following comments from NE peer review
0.2	19/03/14	Laura Robson	Edits following comments from internal JNCC peer review
0.1	19/03/14	Laura Robson	First draft

DISTRIBUTION:

Copy	Version	Issue Date	Issued To
Electronic	1.0	26/06/14	MPA technical group contacts and Cefas
Electronic	0.5	19/06/14	Natural England
Electronic	0.4	19/05/14	MPA technical group intersessionally
Electronic	0.3	15/04/14	SNH, DOE NI, NRW, NE, Cefas and discussion at MPA technical group
Electronic	0.2	19/03/14	James Highfield (NE)
Electronic	0.1	14/03/14	Beth Stoker, Pete Chaniotis, Ollie Payne, Jon Davies, Alice Ramsay, Megan Parry (all JNCC)