Marine Conservation Zone Assessment

Site name: Erme Estuary MCZ
UKMCZ0059

Protected feature(s):
High energy intertidal rock
Intertidal coarse sediment
Intertidal mixed sediment
Low energy intertidal rock
Moderate energy intertidal rock
Estuarine rocky habitats
Sheltered muddy gravels
Tentacled lagoon worm (*Alkmaria romijni*)

Fishing activities assessed at this site:
<u>Stage 1 Assessment</u>
Aquaculture: Shellfish aquaculture: bottom culture, trestle culture

Devon & Severn IFCA
Inshore Fisheries and Conservation Authority

D&S IFCA Reference
ERM-MCZ-007

Contents

Version control history			
Author	**Date**	**Comment**	**Version**
Sarah Curtin	Jan 2022	Draft assessment	0.1
	February 2022	Amended using other estuarine MCZ advice packages with similar habitat	0.2
	November 2022/ January 2023	Finalised assessment (J. Stewart) and review (S. Clark)	1.0

1. Introduction

This assessment has been undertaken by Devon & Severn Inshore Fisheries and Conservation Authority (D&S IFCA) in order to document and determine whether management measures are required to achieve the conservation objectives of marine conservation zones (MCZs). The IFCA's responsibilities in relation to management of MCZs are laid out in Sections 124 to 126, & 154 to 157 of the Marine and Coastal Access Act 2009.

2. MCZ site name(s), and location

The Erme Estuary MCZ is an inshore site of approximately 1km^2 in size. The Erme is located in South Devon and opens into the Western Channel and Celtic Sea region. The MCZ designation covers the whole estuary from the mouth of the river to the limits of the tidal influence near the village of Ermington. The MCZ falls within the Erme Estuary Site of Special Scientific Interest as well as overlapping with the Prawle Point to Plymouth Sound and Eddystone Site of Community Importance at the mouth of the river.

The wide variety of habitats found within the Erme Estuary support a large number of important species including several that are rare, such as the tentacled lagoon worm, *Alkmaria romijni*. This tiny bristleworm grows up to 5mm in length and creates and lives in tubes within the mud habitats of the estuary. These worms have tentacles around their mouths used for gathering food from the surrounding muddy sediments. The tentacled lagoon worm is particularly vulnerable to activities that cause changes in its habitat.

Estuaries create important areas for wading and migratory birds to feed and rest, and form nurseries for juvenile species of fish. The large areas of mudflats and muddy gravel produce films of algae which become exposed at low tide, making them important foraging grounds for several species. The estuarine rocky habitats provide a hard surface for algae and animals to attach in an area dominated by sand and mud with variable salinity. At low tide these areas become foraging grounds for birds and crustaceans and at high tide they create shelter for juvenile species of fish.

At the mouth of the river exposed rocks provide a hard surface for mussels, limpets and barnacles to attach to in areas dominated by sediment and muddy gravel.

Further information regarding the MCZ and its protected features can be found in the Erme Estuary MCZ Factsheet.

3. Feature(s) / habitat(s) of conservation importance (FOCI/HOCI) and conservation objectives

Table 1 - Protected features relevant to this assessment

Feature	**General management approach**
High energy intertidal rock	Maintain in favourable condition
Intertidal coarse sediment	Recover to favourable condition
Intertidal mixed sediment	Maintain in favourable condition
Low energy intertidal rock	Maintain in favourable condition
Moderate energy intertidal rock	Maintain in favourable condition
Estuarine rocky habitats	Maintain in favourable condition
Sheltered muddy gravels	Maintain in favourable condition
Tentacled lagoon worm (*Alkmaria romijni*)	Maintain in favourable condition

As outlined in Table 1, the conservation objectives for these features are that they are brought to, and remain in, favourable condition.

4. Gear/feature interaction in the MCZ categorised as ‘red’ risk and overview of management measure

None - There are no gear/feature interactions in the MCZ that are categorised as ‘red’ risk.

5. Activities under consideration

- Aquaculture: shellfish: bottom and trestle culture

See Curtin (2022) for more information regarding fishing activities occurring in the Erme Estuary MCZ.

6. Is there a risk that activities are hindering the conservation objectives of the MCZ?

No,
Evidence:
This activity is not thought to be occurring in the Erme Estuary MCZ so there is no risk that such activities are hindering the conservation objectives of the MCZ. However, for completeness, to determine whether each pressure is capable of affecting (other than insignificantly) the site’s feature(s), the sensitivity assessments and risk profiling of pressures from the advice on operations section of the Natural England conservation advice package were used (Natural England, 2021). Table 2 shows the fishing activities and pressures included for assessment. The justifications for the pressures chosen for inclusion in this assessment can be seen in Annex 2..

Table 2 - Fishing activities and pressures included in this assessment.

Activity	Pressures
Aquaculture; Shellfish bottom and trestle culture	Abrasion/disturbance of the substrate on the surface of the seabed
	Changes in suspended solids (water clarity)
	Genetic modification & translocation of indigenous species
	Introduction of microbial pathogens
	Introduction or spread of invasive species non-indigenous species (INIS)
	Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion
	Removal of non-target species
	Removal of target species
	Smothering and siltation rate changes (Light)

It should be noted that no conservation advice package is currently available (November 2022) for the Erme Estuary MCZ. Therefore, relevant advice on operations and supplementary advice tables for other sites with similar features were used alongside considering site specific information.

Table 3 - Relevant favourable condition targets for identified pressures.

Feature	Conservation advice package used
High energy intertidal rock	No alternative CA package found, moderate energy intertidal

	rock used as proxy
Low energy intertidal rock	Dart Estuary MCZ
Estuarine rocky habitats	
Moderate energy intertidal rock	Devon Avon Estuary MCZ
Intertidal coarse sediment	Axe Estuary MCZ
Intertidal mixed sediment	
Sheltered muddy gravels	No alternative CA package found, intertidal mud used as proxy
Tentacled lagoon worm (*Alkmaria romijni*)	Dart Estuary MCZ

7. Can D&S IFCA exercise its functions to further the conservation objectives of the site?

Yes,
Evidence: Monitoring and Control Arrangements
Within estuaries, land may be privately owned by individual estate owners and leased to shellfishers for the cultivation of shellfish.

- Monitoring of activities in the estuary.
- Review D&S IFCA's Mariculture Strategy to ensure development of aquaculture is sustainable in line with D&S IFCA's obligations under Section 153 (2) of the Marine and Coastal Access Act (2009).
- The review of D&S IFCA byelaws can gauge where any future changes or developments may occur.

8. Referenced supporting information to inform assessment

Currently, blue mussels (*Mytilus spp.*) and Pacific oysters (*Crassostrea gigas*) are the only mariculture species being actively farmed and harvested within the D&S IFCA's District, although scallop ranching is being developed within Torbay. Literature on the environmental impacts of aquaculture is dominated by changes to sediment and associated infaunal assemblages beneath cultivation areas (Forrest *et al.*, 2009).

Benthic effects
As a consequence of their filtration capabilities, oysters can produce huge amounts of pseudo-faeces and faeces (Deslous-Paoli *et al.*, 2004). These biodeposits mostly accumulate on sediments close to or directly beneath oyster cultures (Ottmann and Sornin, 1985; Mitchell, 2006). This biodeposition may impact the benthic environment surrounding the cultures. The deposition may elevate intertidal mudflat levels (Bertin *et al.*, 2005), enrich seabed sediments with organic matter (Mitchell, 2006), and alter the physical structure and geochemical functioning of the sediments involved (Bouchet *et al.*, 2007). Changes in physicochemical characteristics beneath oyster cultures can lead to displacement of macrofauna and an increase in more disturbance-tolerant opportunistic species (Pearson and Rosenberg, 1977). The extent of these effects mainly depend on the hydrodynamic features of the culture site but may also depend on oyster culture methods (Goulletquer and Heral, 1997). As such, studies investigating the effects of shellfish cultivation in intertidal areas have reported levels of impact that vary between sites. Castel *et al.* (1989) reported that organic enrichment and low bottom oxygen concentrations, associated with bottom cultivation of the Pacific oyster in France, resulted in significant decreases in diversity and abundance of microbenthic species. Similar effects of trestle oyster cultivation in intertidal microbenthic communities were observed in the River Exe (Nugues *et al.*, 1996). In contrast, a study at an extensive oyster trestle farm in Dungarvan Harbour, Ireland, showed no evidence of organic enrichment (De Grave *et al.*, 1998). The magnitude of benthic enrichment from trestle

intertidal culture is generally relatively minor by comparison with suspended subtidal culture of fish (Brown *et al.*, 1987; Forrest *et al.*, 2009)

In the D&S IFCA District, oysters are either cultivated directly on the sediment (bottom culture) or are placed in plastic mesh bags tied to metal trestles (trestle culture). The presence of trestles arranged in parallel rows in the intertidal area has been shown to significantly reduce the strength of tidal currents (Nugues *et al.*, 1996). This limits the dispersal of pseudo-faeces and faeces in the water column and thus increases the natural sedimentation process by several orders of magnitude (Ottmann and Sornin, 1985).

The effects of bivalves on sediment properties depend on the density of shellfish relative to water flow. However, the majority of literature on sediment effects is in the context of suspended culture. In terms of sediment alteration, the effects of bivalves are expected to be local (Dumbauld *et al.*, 2009). Ysebaert *et al.* (2009) found that sediment grain size was smaller in cultured sites in Denmark and particulate organic carbon, nitrogen and phosphorus content was higher compared to culture-free sediment. These changes on the sedimentary environment were localised and limited to the mussel bed or its direct surroundings. However, the effect of mussel culture on the benthic community may have been positive, with an increase in the number of epibenthic species seen. Similarly, Dolmer (2002) suggested a positive relationship between mussel abundance and the number of associated species due to the complex substratum created by the mussels.

Water clarity
Mussels and other filter feeders can improve water quality and clarity, making the marine ecosystem more suitable for other organisms (Avdelas *et al.*, 2021). Most species of cultured bivalve molluscs clear particles from waters at rates of 1 to 4 litres per hour, and populations of shellfish in healthy assemblages can filter a substantial fraction of the water in coastal estuaries on a daily basis. Actively growing shellfish incorporate nitrogen and other nutrients into their tissues as they grow. On average, 16.8 g of nitrogen is removed from estuaries for every kilogram of shellfish meat harvested. In addition to removal of nutrients through shellfisheries and molluscan aquaculture, shellfish beds may act to promote removal of nitrogen from estuaries by increasing organic nitrogen deposition to the sediments that stimulate denitrification processes (Rice, 2001).

Introduction of microbial pathogens and invasive non-native species
Introduction of Invasive Non-Native Species (INNS) as a result of aquaculture can occur in two ways; either by INNS being intentionally introduced for the purposes of aquaculture (i.e. Pacific oyster and historically, the Manila clam (*Ruditapes philippinarum*)) or being accidentally introduced with aquaculture species (i.e. with seed or in batches of adult stock). Intentional introductions are normally due to the species providing economic benefit, fast growth and adaptation to a wide ecological niche (Cook *et al.*, 2008): commercial considerations which have often outweighed the initial available evidence of potential ecological risk (Gozlan, 2010). Intentional introductions are usually subject to some form of testing prior to introduction to reduce the risk of environmental impacts but this does not always eliminate the risk entirely. The biggest risk comes from the accidental introduction of INNS to the marine environment. This can be through spillover, escape or accidents in operation when farming INNS (Cook *et al.*, 2008). Where species have been introduced for aquaculture there have been documented ecological impacts on native fauna via disease introduction and direct competition with native species with no associated ecosystem benefits (Gozlan, 2010). The intentional introduction of the Pacific oyster to the Pacific north west (USA) resulted in the unintentional introduction of the invasive smooth cordgrass *Spartina alterniflora*, which was used as packing material for the transplanted oysters (Feist and Simenstad, 2000). *S. alterniflora* can re-engineer a habitat by providing biogenic structures that allow for fish, invertebrate and macroalgal recruitment and sediment accumulation (Ruesink *et al.*, 2006). Habitat modification was also caused in South African waters following the accidental introduction of the Mediterranean mussel *Mytilus galloprovincialis* (Robinson *et al.*, 2005). The species became

the dominant intertidal mussel and modified the natural community composition by dominating rock surfaces. In addition, the faster growth, greater tolerance to desiccation and higher fecundity led to it being more dominant than the native mussel species (Robinson *et al.*, 2005).

The introduction of oyster species including *Crassostrea gigas* and *Crassostrea virginica* have been suggested as one of the greatest single modes of introduction for other INNS species around the world and are well suited to establishing wild populations (Mckindsey *et al.*, 2007). In the Netherlands and the German Wadden Sea, *C. gigas* introduced for aquaculture has formed natural, self-sustaining populations which have caused issues for mussel culture and conservation (Mckindsey *et al.*, 2007). However, the introduction of *C. gigas* has also been documented to have benefits to local ecosystems. The presence of *C. gigas* on the intertidal was seen to increase the abundance of infauna and epifauna as well as bird species relative to a control site (Escapa *et al.*, 2004). Also, a study in Washington State showed that diversity and abundance of benthic organisms in mud flats were increased by the presence of *C. gigas* and on rocky shores in British Columbia, *C. gigas*, occupying the high intertidal zone, increased the surface area for barnacle species (Ruesink *et al.*, 2005).

Shellfish diseases can be spread by movement of animals. A parasite that deteriorates digestive tissues of host organisms, known as the paramyxean parasite, *Marteilia refringens*, has been documented to cause mass mortalities in the European native oyster *Ostrea edulis* where movements of shellfish appear to have spread the disease between France, Spain and the Netherlands. In addition, the disease, bonamiasis, caused by the haplosporidean parasite *Bonamia ostreae*, was also introduced to Europe via introduction of infected native oyster, *O. edulis* from North America. First mapped in France, it has spread across Europe including the UK and is regarded as a major threat to oyster stocks (Gozlan *et al.*, 2006).

Genetic modification and translocation of indigenous species

Species hybridisation is an issue pertinent to the Southwest as there is mixing and hybridisation of two species of blue mussel: the native *M. edulis* and non-native *M. galloprovincialis*. For the majority of England *M. edulis* is the dominant species with low to negligible spatial competition with other blue mussel species. In the Southwest, *M. galloprovincialis* is also established. *M. edulis* and *M. galloprovincialis* both occupy similar environmental niches and can hybridise with one another to produce viable offspring. These hybrids have only been found in areas of high aquaculture activity where the two species mix (Michalek *et al.*, 2016)

The impacts of hybridisation of differing mussel species even within UK waters, although largely unknown, can be negative. For example, *M. trossulus* is a non-native species of mussel present in parts of in Scotland that is currently having a negative economic impact on local shellfish farms due to hybridisation with stock mussels. Unlike *M. edulis, M. trossulus* have very thin and brittle shells making them unsuitable for commercial sale. They have manged to successfully hybridise with other *Mytilus* species, producing offspring with the same traits. The difficulty in being able to tell either species apart means that mariculturists may unknowingly produce large volumes of the unsellable *M. trossulus* alongside *M. edulis* (Michalek *et al.*, 2016; Vendrami *et al.*, 2020). The long-term effects of hybridisation of *M. galloprovincialis* with *M. edulis* remain to be seen, and though they may not be as potentially negative as the case seen in Scotland with *M. trossulus,* decreased reproductive fitness is sometimes seen in hybridisation of distinct populations in other species (Vendrami *et al.*, 2020).

Hybridisation is also occurring between the Portuguese oyster (*Crassostrea angulata*) and the Pacific oyster (*C. gigas*) between France and Portugal (OSPAR Commission, 2009). Another example of the negative effects of mixing of distinct populations is in farmed salmon. Escape and accidental release of reared salmon has resulted in global instances of interbreeding of reared stock with wild stock. The resulting wild/reared hybrids tend to have decreased reproductive fitness which as a result threatens the stability of wild populations (Sylvester *et al.*, 2019). Similar consequences should be considered for wild finfish populations in the District if finfish mariculture becomes established.

9. In-combination assessment

Table 4 - Relevant activities occurring in or close to the site

<table>
<tr><th colspan="3">Plans and Projects</th></tr>
<tr><th>Activity</th><th>Description</th><th>Potential Pressure(s)</th></tr>
<tr><td>No other plans or projects known to be occurring within Erme Estuary MCZ</td><td>The impact of future plans or projects will require assessment in their own right, including accounting for any in-combination effects, alongside existing activities.</td><td>N/A</td></tr>
<tr><th colspan="3">Other activities being considered</th></tr>
<tr><th>Activity</th><th>Description</th><th>Potential Pressure(s)</th></tr>
<tr><td>Crab tiling</td><td>There is no evidence that this activity is currently occurring. Additionally, as the activities assessed (section 5) are not occurring within the MCZ, it is thought there is no in-combination effect.</td><td rowspan="5">Abrasion/disturbance of the substrate on the surface of the seabed

Habitat structure changes - removal of substratum (extraction)

Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion

Removal of non-target species

Removal of target species

Changes in suspended solids (water clarity)

Smothering and siltation rate changes (Light)

Genetic modification & translocation of indigenous species

Introduction of microbial pathogens

Introduction or spread of invasive non indigenous species</td></tr>
<tr><td>Bait digging</td><td>Activity is occurring, but only at low levels and limited locations. Additionally, as the activities assessed (section 5) are not occurring within the MCZ, it is thought there is no in-combination effect.</td></tr>
<tr><td>Static – fixed nets: Gill nets, Trammels, Entangling</td><td>This activity is currently not permitted to take place within the Erme Estuary MCZ as it falls under the D&S IFCA Netting Permit Byelaw. In the estuary landward of the coordinates set out in Annex 1, Figure 3, a permit holder or named representative is not authorised to use any net other than a seine net (alongside additional conditions outlined in the Permit Conditions). Therefore no in-combination effect is thought to be possible. Additionally, as the activities assessed (section 5) are not occurring, it is thought there is no in-combination effect.</td></tr>
<tr><td>Passive – nets: Drift nets (demersal)</td><td>This activity is currently not permitted to take place within the Erme Estuary MCZ as it falls under the D&S IFCA Netting Permit Byelaw. In the estuary landward of the coordinates set out in Annex 1, Figure 3, a permit holder or named representative is not authorised to use any net other than a seine net. Therefore no in-combination effect is thought to be possible. Additionally, as the activities assessed (section 5) are not occurring, it is thought there is no in-combination effect.</td></tr>
<tr><td>Seine nets and other; Shrimp push nets, fyke and stakenets, ring nets</td><td>This activity is currently not permitted to take place within the Erme Estuary MCZ as it falls under the D&S IFCA Netting Permit Byelaw. In the estuary landward of the coordinates set out</td></tr>
</table>

	in Annex 1, Figure 3, a permit holder or named representative is not authorised to use any net other than a seine net. Therefore no in-combination effect is thought to be possible. Additionally, as the activities assessed (section 5) are not occurring, it is thought there is no in-combination effect.	
Hand working (access from land/access from vessel)	Activity is occurring, but only at low levels. Additionally, as the activities assessed (section 5) are not occurring within the MCZ, it is thought there is no in-combination effect.	
Beach seine netting	There is no evidence that this activity is currently occurring. Additionally, as the activities assessed (section 5) are not occurring, it is thought there is no in-combination effect.	
Static – pots/traps: Pots/creels, cuttlepots, fish traps	Activity is occurring but only at a low levels. Additionally, as the activities assessed (section 5) are not occurring, it is thought there is no in-combination effect.	

D&S IFCA concludes there is no likelihood of significant adverse effect on the interest features from in-combination effects addressed within Table 4.

10. NE consultation response

N/A Natural England has not been consulted at this stage.

11. Conclusion

The literature detailed in section 8 found that aquaculture could influence sediment characteristics and the associated infaunal assemblages beneath cultivation areas. However, changes in sediments characteristics will depend on the density of shellfish relative to water flow. In addition, aquaculture may result in the introduction of invasive non-native species as well as disease.

However, shellfish aquaculture is not believed to be occurring within the Erme Estuary and there are no areas in the Erme that are classified for shellfish harvesting by CEFAS. In addition, the estuary is privately owned and therefore any future shellfish farming is unlikely to be approved. D&S IFCA will continue to monitor activities on the estuary and ensure any future development of aquaculture is sustainable in line with D&S IFCA's obligations under Section 153 (2) of the Marine and Coastal Access Act (2009). As the activities assessed are not believed to be occurring within the MCZ, D&S IFCA concludes that there is no significant risk of the activities hindering the achievement of the conservation objectives for Erme Estuary MCZ.

12. Summary table

Feature or habitat of Conservation interest	Conservation objectives/ Target Attributes (Natural England, 2021)	Activity	Potential pressures from activity and sensitivity of habitats to pressures. (Natural England, 2021)	Potential exposure to pressures and mechanism of impact significance	Is there a risk that the activity could hinder the achievement of conservation objectives of the site?	Can D&S IFCA exercise its functions to further the conservation objectives of the site? If Yes, list management options
Intertidal coarse sediment Intertidal mixed sediment Sheltered muddy gravels	Maintain the presence and spatial distribution of intertidal coarse sediment communities Maintain the total extent and spatial distribution of intertidal coarse sediment (Maintain OR Recover OR Restore) the abundance of listed to enable each of them to be a viable component of the habitat Maintain the species composition of	Commercial fishing; Aquaculture; Shellfish bottom culture / shellfish trestle culture	• Abrasion/disturbance of the substrate on the surface of the seabed • Changes in suspended solids (water clarity) • Genetic modification & translocation of indigenous species • Introduction of microbial pathogens • Introduction or spread of invasive species non-indigenous species (INIS) • Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion • Removal of non-target species • Removal of target species • Smothering and siltation rate changes (Light) See Annex 2 for pressures audit trail	No exposure Shellfish farming is not currently occurring within the Erme estuary and no CEFAS classification maps.	Activities not believed to be occurring D&S IFCA concludes that there is no significant risk of the activities hindering the achievement of the conservation objectives.	Yes, Management measures could include: 1. Monitoring of activities in the estuary. 2. Review the mariculture strategy to ensure development of aquaculture is sustainable in line with D&S IFCA's obligations under Section 153 (2) of the Marine and Coastal Access Act (2009). 3. The review of D&S IFCA byelaws can gauge where any future changes or developments may occur.

	component communities					
Tentacle lagoon worm (*Alkmaria romijni*)	Maintain the population size within the site. Maintain the reproductive and recruitment capability of the species. Maintain connectivity of the habitat within sites and the wider environment to ensure larval dispersal and recruitment, and / or to allow movement of migratory species. Maintain the extent and spatial	Commercial fishing; Aquaculture; Shellfish bottom culture / shellfish trestle culture	• Abrasion/disturbance of the substrate on the surface of the seabed • Changes in suspended solids (water clarity) • Genetic modification & translocation of indigenous species • Introduction of microbial pathogens • Introduction or spread of invasive species non-indigenous species (INIS) • Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion • Removal of non-target species • Removal of target species • Smothering and siltation rate changes (Light) See Annex 2 for pressures audit trail	See above	See above	See above

	distribution of the following known supporting habitat: intertidal mud.					
High energy intertidal rock Low energy intertidal rock Moderate energy intertidal rock Estuarine rocky habitats	Maintain the presence and spatial distribution of intertidal rock communities Maintain the total extent and spatial distribution of intertidal rock subject to natural variation in sediment veneer [Maintain OR Recover OR Restore] the abundance of listed species to enable each of them to be a viable component of the habitat Recover the species composition of component	Commercial fishing; Aquaculture; Shellfish bottom culture / shellfish trestle culture	• Abrasion/disturbance of the substrate on the surface of the seabed • Changes in suspended solids (water clarity) • Genetic modification & translocation of indigenous species • Introduction of microbial pathogens • Introduction or spread of invasive species non-indigenous species (INIS) • Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion • Removal of non-target species • Removal of target species • Smothering and siltation rate changes (Light) See Annex 2 for pressures audit trail	See above	See above	See above

	communities					

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Annex 1: Site Map(s)

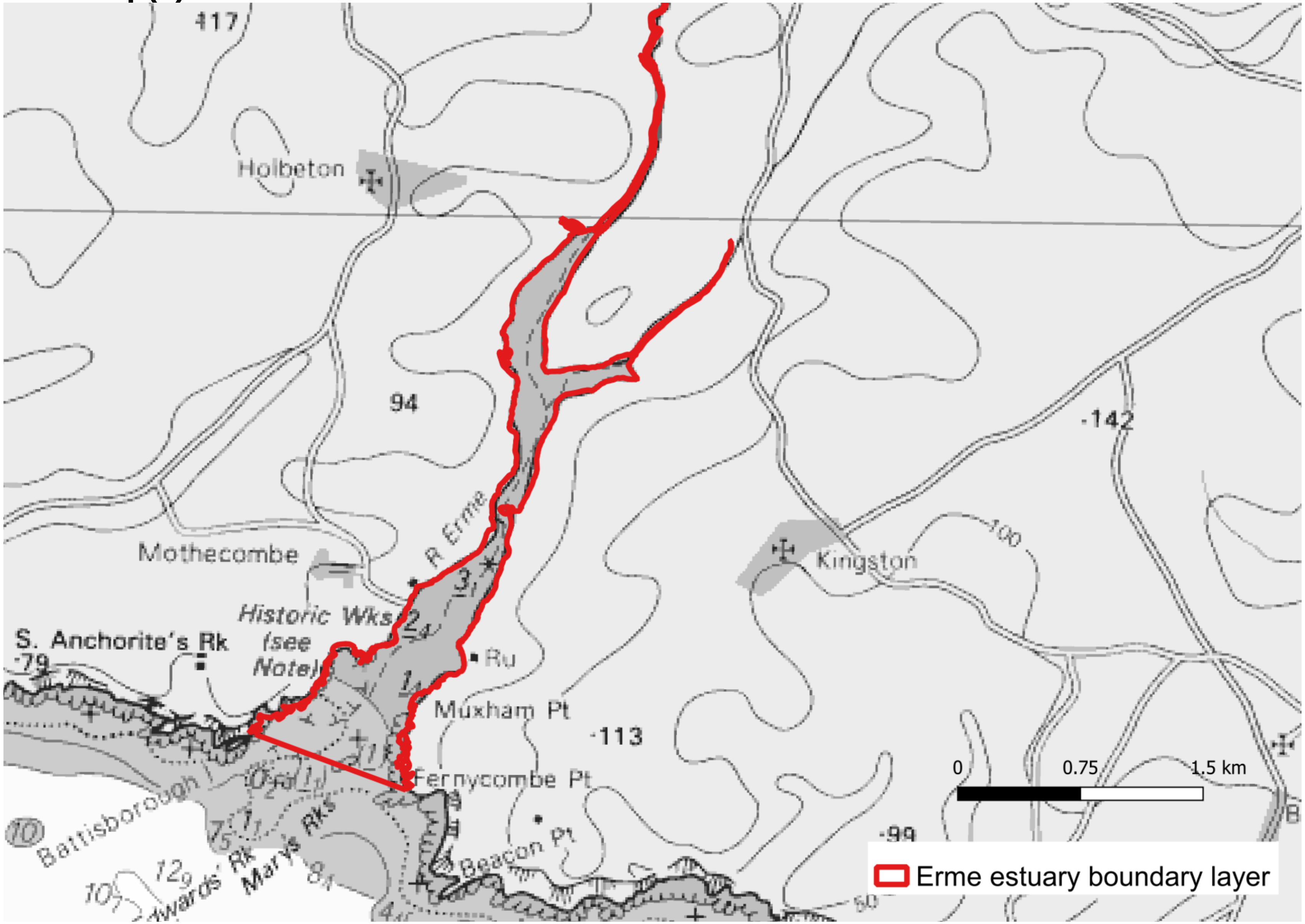


Figure 1 – Erme Estuary MCZ

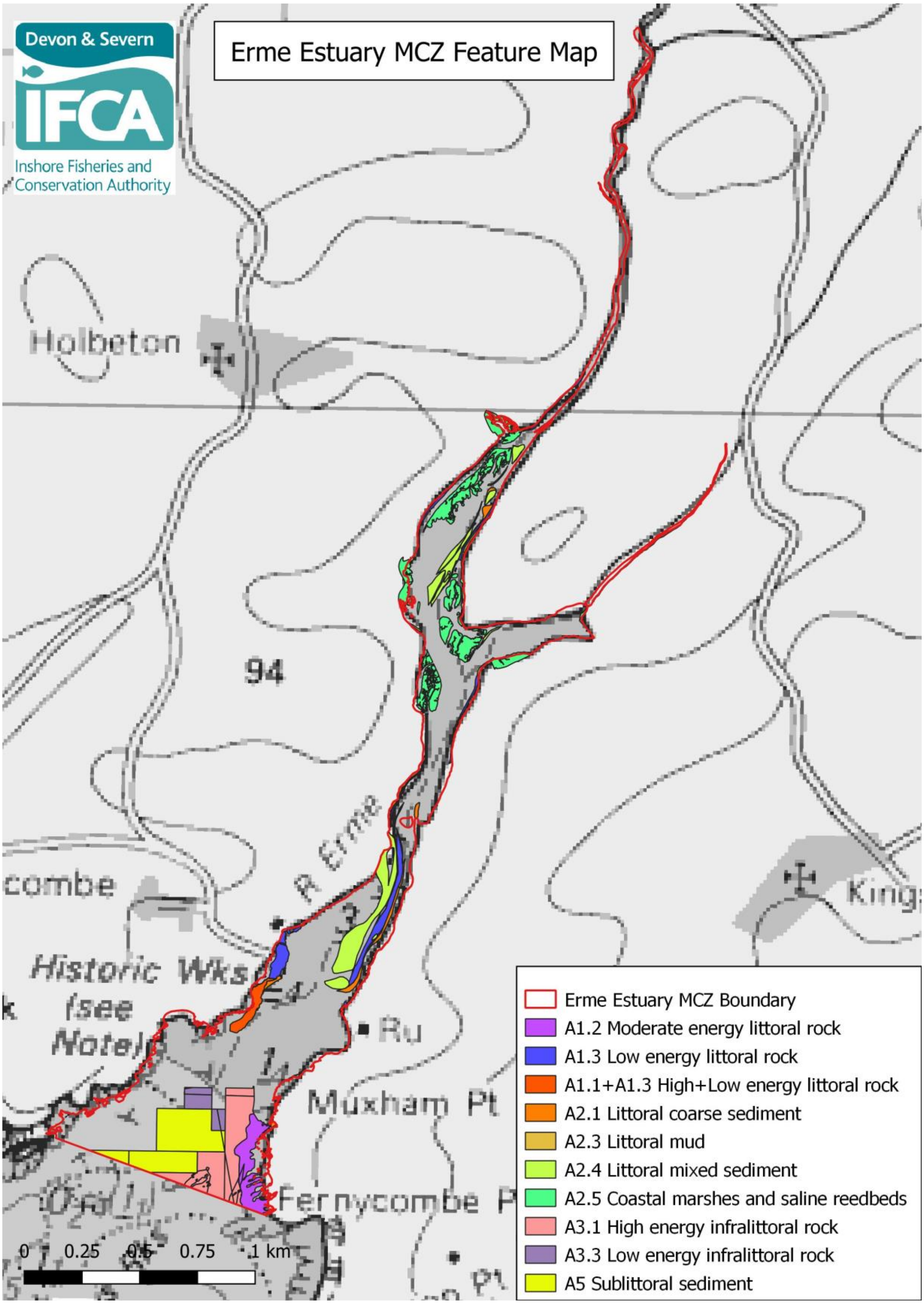
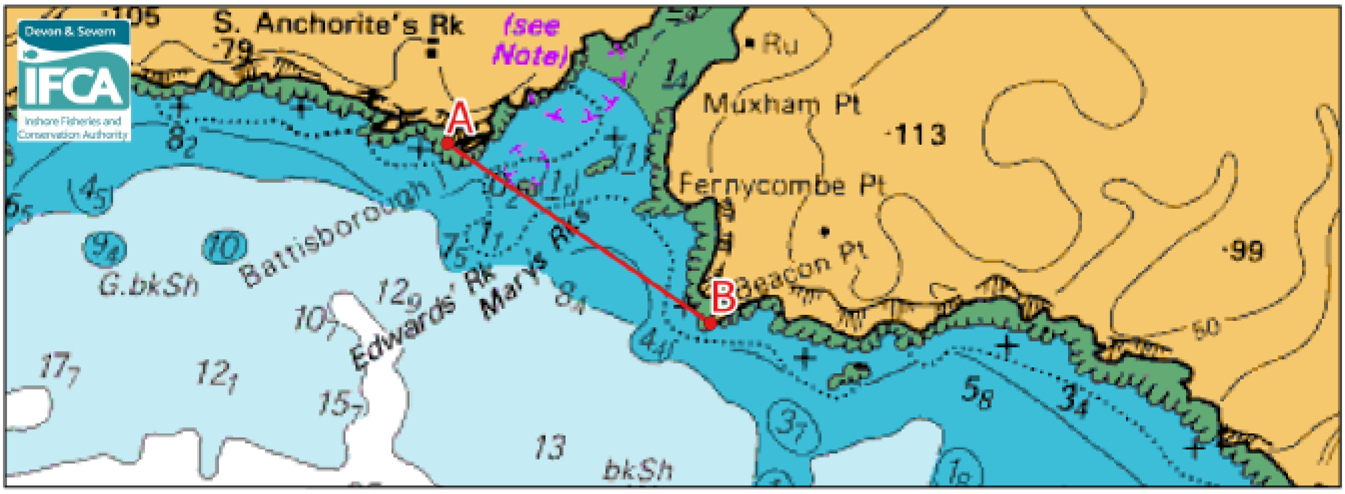


Figure 2: Extent of features designated in the Erme Estuary MCZ

Annex 2 Chart of River Erme closing line - No access to the use of nets other than a seine net in accordance with paragraph 3.2 of the Netting Permit Conditions



Estuary closing line

River Erme closing line latitude and longitude positions:

Point	Latitude	Longitude
A (Battisborough Island)	50° 18.243'N	003° 57.834'W
B (Beacon Point)	50° 17.750'N	003° 56.657'W

Figure 3: River Erme closing line latitude and longitude. No access landward of the line to the use of nets other than a seine net in accordance with paragraph 3.2 of the Netting Permit Conditions.

Annex 2: Pressures Audit Trail

Fishing Activity Pressures: Shellfish aquaculture: bottom culture	Intertidal coarse sediment	Intertidal mixed sediment	Sheltered muddy gravels	Tentacled lagoon worm	High energy intertidal rock	Moderate energy intertidal rock	Low energy intertidal rock	Estuarine rocky habitats	Screening Justification
Abrasion/disturbance of the substrate on the surface of the seabed	NS	S	S	S	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Changes in suspended solids (water clarity)	NS	S	S	NS	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Genetic modification & translocation of indigenous species		IE		IE	IE	IE	IE	IE	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Introduction of microbial pathogens		S	NS	IE	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Introduction or spread of invasive non-indigenous species (INIS)		S	S	IE	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion	NS	S	S	S	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Removal of non-target species		S	S	IE	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Removal of target species								S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Smothering and siltation rate changes (Light)	NS	S	S	S	S	S	S	S	IN – Need to consider spatial scale/intensity of activity to determine likely magnitude of pressure
Deoxygenation	NS	S	NS	NS	S	S	S	NS	OUT – Insufficient activity levels to pose risk at level of concern
Hydrocarbon & PAH contamination	NA	NA	NA	NA	NA	NA	NA	NA	OUT – Not applicable
Introduction of light		IE	NS		S	S	S	S	OUT – Insufficient activity levels to pose risk at level of concern
Litter	NA	NA	NA	NA	NA	NA	NA	NA	OUT – Not applicable
Nutrient enrichment	NS	NS	NS	NS	IE	IE	IE	IE	OUT – Insufficient activity levels to pose risk at level of concern
Organic enrichment	NS	NS	NS	NS	S	S	S	S	OUT – Insufficient activity levels to pose risk at level of concern
Physical change (to another seabed type)				S	S	S	S	S	OUT – Insufficient activity levels to pose risk at level of concern
Physical change (to another sediment type)	S	S	S	S					OUT – Insufficient activity levels to pose risk at level of concern
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals)	NA	NA	NA	NA	NA	NA	NA	NA	OUT – Not applicable
Transition elements & organo-metal (e.g. TBT) contamination	NA	NA	NA	NA	NA	NA	NA	NA	OUT – Not applicable
Underwater noise changes							IE	IE	OUT – Not applicable