SSSI Assessment

Site name: Taw-Torridge Estuary SSSI

Protected feature(s):

Overwintering and migratory populations of wading birds
Rare plants
Intertidal Mudflats
Intertidal Sandflats
Beaches
Saltmarsh
Typical estuarine species (fish)
Rocky Outcrops
Estuarine fish
Migratory fish

Fishing activities assessed at this site:

Stage 1 Assessment

Sub-tidal mussel removal and re-laying on intertidal soft and coarse sediments and rocky shore

Devon & Severn IFCA
Inshore Fisheries and Conservation Authority

D&S IFCA Reference
TTE-3SI-001

Contents

Version Date	Reviewer	Amendment
15th December 2020	Sarah Clark	Amended the position of dredge area 1

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 a pilot study to trial the removal of a limited quantity of subtidal mussels and subsequent intertidal relaying of that mussels within the Taw-Torridge Estuary is consistent with the duty to further the conservation and enhancement of the special interest features of the SSSI.

The Taw-Torridge Estuary SSSI was notified under Section 28 of the Wildlife and Countryside Act, 1981, as amended. Devon and Severn IFCA have duties as a section 28G body under the Countryside and Rights of Way (CRoW) Act (2000).

2. SSSI site name(s), and location

The Taw-Torridge SSSI is located in North Devon at the confluence of two rivers; the Taw and the Torridge. The site covers an intertidal area of 1,336.5 ha (3,302.5ac).

The site formerly included most of Fremington Quay Cliffs SSSI and part of Greenaways and Freshmarsh SSSI, which are notified separately. The site boundary has also been amended by deletion and extension.

3. Special interest features of the SSSI

Table 1 - Protected features relevant to this assessment

Feature	**Named species**
Overwintering and migratory populations of wading birds	Golden plover, *Pluvialis apricaria*
	Lapwing, *Vanellus*
	Curlew, *Numenius arquata*
	Redshank, *Tringa totanus*
	Dunlin, *Calidris alpina*
	Oystercatcher *Haematopus ostralegus*
Intertidal Mudflats	Peppery furrow-shell *Scorbicularia plana*
Intertidal Sandbanks	
Beaches	
Saltmarsh	Glassworts Salicornia spp
	Common saltmarsh-grass *Puccinellia maritima*
	Cord-grass Spartina spp
	Sea aster *tripolium*
	Annual seablite *Suaeda maritima*
	Red fescue *Festuca rubra*
	Sea rush *Juncus maritimus*
	Common reed *Phragmites australis*
	Sea wormwood *Artemisia maritima*
	Rock sea-lavender *Limonium binervosum*
	Great sea-stock *Matthiola sinuata*
Saltpill Duck Pond	Willows Salix spp
Estuarine fish	Mullet sp.
	Flat fish

	Bass *Dicentrarchus labrax*
	Pollack *Pollachius*
	Salmon *Salmo salar*
	Sea trout *Salmo trutta*
	European eel *Anguilla*
Mussel beds on rocky outcrops, seawalls and sones on the banks	Blue mussels *Mytilus edulis*

It should be noted that, due to natural fluctuations in the bird assemblage over time, any native wetland bird species (including waders and wildfowl) can be considered part of the bird assemblage (Natural England 1998).

4. Activities under consideration

This assessment is considering the risk of a pilot-scale study to remove a relatively small quantity of mussels from the subtidal area, outside the SSSI and to relay it in the intertidal area, within the SSSI. D&S IFCA is currently looking at how it can better manage the shellfisheries on the Taw Torridge Estuary and the trial study being considered here is the first step in that process.

The mussels will be fished using a traditional Baird mussel dredge of 1m. Figure 1 shows the two proposed areas of removal, in the central channel downstream of Sprat Ridge. As a small-scale trial, up to five tonnes of subtidal mussels will be removed. In the Wash a typical re-laying trial will harvest 40 tonnes of mussels; enough to seed an intertidal area of about 1ha (R. Jessop EIFCA, *pers. comm*.). The mussels will be removed and immediately relayed over a neap high tide in the late Autumn/ early winter of 2020 in an attempt to utilise the ephemeral resource before it is removed by winter storms.

The dredge will not interact with the features of the SSSI, but consideration is given to the potential effects of mussel removal on the intertidal mussels and the bird and fish features.

5. Is there a risk that activities are hindering the duty to further the conservation and enhancement of the special interest features of the SSSI?

No

The subtidal mussel beds are not part of the SSSI. However, D&S IFCA has identified four potential impact pathways through which the removal and relaying of the mussels might hinder the duty to ensure the conservation of the special interest features of the SSSI either through the removal of the mussels or relaying of the mussels.

1. Removal of subtidal mussels – impact on designated intertidal mussel beds
2. Removal of subtidal mussels – impact on designated estuarine fish
3. Relaying of mussels – impact on designated intertidal habitats
4. Relaying of mussels – disturbance to designated bird assemblage

Each of these potential impacts is considered in more detail below.

5.1 Removal of subtidal mussels - impact on intertidal mussel beds

Fishing for mussels in the subtidal waters of the Taw-Torridge Estuary would reduce the extent and biomass of the sublittoral mussels and may change the sublittoral biota in the area. Little is known of the population dynamics of subtidal mussels, or how they may contribute spat to the intertidal beds; however, it is thought that mature mussels are unlikely to relocate between subtidal and intertidal areas (R. Jessop EIFCA, *pers. comm.*). In addition, sublittoral mussel beds are often considered to be ephemeral and unstable. In the Wash, and Europe more widely, subtidal beds are typically expected to persist for 1 – 3 years, or even less (Dare et al. 2004). Removal of mussels would therefore occur against a background of dynamic change. The susceptibility of subtidal mussels to being washed away is reviewed in Stewart (2020). Two age classes of mussels are thought to exist in subtidal areas of the Taw-Torridge Estuary that were surveyed in 2020 but these age classes rarely co-exist at fine spatial scales (Stewart, 2020), which supports an assertion of ephemerality of these beds (Stewart, 2020). In the areas targeted for proposed dredging, the subtidal mussels likely consist of a single age class in each area (Stewart, 2020).

5.2 Removal of subtidal mussels – impact on estuarine fish

Several fish species, named in the Taw-Torridge Estuary SSSI notification, may include mussels in their diets, and these include adult thin- and thick- lipped mullet, flounder, plaice and dab (Table 1). Some of the flatfish species (especially flounder, plaice and dab) can be important predators of subtidal seed mussels (Saurel et al. 2004). However, even the smaller size class of mussels found in the Taw Torridge Estuary is much larger than mussels found in the stomachs of flounder and plaice in Morecambe Bay, where the range of mussels sizes consumed was found to be 1–15mm long (Saurel et al. 2004). Other organisms associated with subtidal mussel beds such as ragworm (*Hediste diversicolor*) and shore crab (*Carcinus maenas*) are also important prey for flounder (Summers 1980). Whilst fish may feed on or around the subtidal mussels in the Taw Torridge Estuary all the species in the notification also feed on many other organisms (Table 2, below) and are unlikely to be reliant on the ephemeral subtidal mussels in the Taw Torridge Estuary.

Table 2. Diet of fish species named in the Taw-Torridge Estuary SSSI notification. Main flatfish species based upon D&S IFCA knowledge.

Species	**Diet**	**Evidence**
Bass (*Dicentrarchus labrax*)	Wide range of fishes including herring, sprats, herring, pilchard, sandeels, sand gobies & other schooling fishes. Squid & various crustaceans. Young bass mainly eat small crustaceans.	Wheeler (1969) Dipper (2001) Henderson (2014)
Thick lipped grey mullet (*Chelon labrosus*).	Benthic organic matter including plant matter, nematodes, copepods and other infauna. Diatoms and algae grazed off hard structures, seaweed. Larger fish feed on **molluscs** and small crustaceans.	Wheeler (1969) Dipper (2001) Henderson (2014)
Golden grey mullet (*Liza aurata*)	Algae & benthic detritus, small benthic organisms, occasionally insects and plankton	Wheeler (1969) Dipper (2001) Henderson (2014)
Thin-lipped grey mullet (*Liza ramada*)	Benthic organic matter including plant matter, nematodes, copepods and other infauna. Larger fish feed on **molluscs** and small crustaceans.	Wheeler (1969) Dipper (2001) Henderson (2014)

Pollack (*Pollachius pollachius*)	Fish including sandeels, clupeids & gadoids. Crustaceans.	Wheeler (1969) Dipper (2001) Henderson (2014)
Flounder (*Platichthys flesus*)	**Molluscs**, worms, crustaceans	Wheeler (1969) Dipper (2001) Henderson (2014)
Sole (*Solea solea*)	Small crustaceans, worms, **small molluscs**, occasionally fish.	Wheeler (1969) Dipper (2001) Henderson (2014)
Dab (*Limanda limanda)*	Crustaceans, small fish, echinoderms, amphipods, **molluscs**	Froese and Pauly (2019) Henderson (2014)
Plaice (*Pleuronectes platessa*)	**Molluscs**, crustaceans, worms, brittlestars, sandeels.	Wheeler (1969) Dipper (2001) Henderson (2014)
Salmon (*Salmo salar*)	Insects, **molluscs**, crustaceans and fish, squids, shrimp	Froese and Pauly (2019)
Sea trout (*Salmo trutta*)	Fish & crustaceans	Wheeler (1969) Henderson (2014)
European eel (*Anguilla anguilla*)	Amphipods, crustaceans, polychaetes, **molluscs**, shrimp, fish	Costa et al. (1992)

5.3 Relaying of mussels – impact on intertidal habitats

The proposed relaying zone is located within unit 103 of the Taw-Torridge Estuary SSSI, which is in favourable condition (Natural England, 2012). The intertidal habitats located in the proposed relaying zone are lower sensitivity WFD habitats: soft sediment (sand, mud and mixed), coarse sediments (gravel and cobble) and rocky intertidal shore (Natural England, 2020), and includes existing mussel beds. The soft sediments areas are dominated by sand, rather than mud (Natural England, 2012). Disturbance may be expected in terms of a shift in community composition due to increased density of mussels, although the amount for the proposed relaying is relatively small at five tonnes. Mussels beds support their own diverse communities as the mussel matrix, composed of interconnected mussels and accumulated sediments and debris, provides numerous microhabitats and an organically enriched environment (Andrews *et al*., 2011, Seed and Suchanek, 1992). However, the disturbance may not be substantial: an assessment for similar activities in Castlemaine Harbour found that that the species composition of benthic macrofauna in sand and in sand/mud under mussel cover is largely similar (Marine Institute, 2011). Furthermore, the area likely to be affected in the Taw-Torridge Estuary is very small (Figure 1), and near the edge of an intertidal mussel bed that appears to fluctuate in extent and density between years (Thomas, 2019).

The mussels will be re-laid at a density which is known to allow attachment of the new mussels onto the existing mussels bed or hard substrate (R. Jessop, EIFCA *pers. comm.*). Whilst re-laying too densely may result in smothering or changes to the natural size structure of the mussel bed, the small scale of this pilot is very unlikely to have a negative impact on the bed. Furthermore, the target area contains suitable substrate for mussel establishment, but recent observations suggest sparse mussel coverage in target areas around the Oil Jetty (J. Stewart, *pers. obs.*). The mussel density and percentage cover in the nearby Coolstone intertidal bed is low relative to recent years and relative to other nearby intertidal mussel beds (Thomas, 2019); re-laying mussels in this area may therefore promote recovery of natural mussel beds.

Additionally, under the SSSI notification the intertidal mudflats and sandbanks, where mussel beds are found, are important habitats for the overwintering birds. The area around the Oil Jetty is not one which is particularly important for feeding or roosting birds (see text in below section).

5.4 Relaying of mussels – bird disturbance

Bird disturbance during dredging of the subtidal mussels is unlikely to be an issue due to the mid-channel location of the subtidal beds and distance from high tide roost sites (Figure 1a and 1b). Initially the proposed areas to be dredged were to be located as shown in Figure 1a. However on discussion with the fishers operating in the area and the smaller size of mussel found slightly further out of the estuary, a new dredge area is proposed (Figure 1b). The new location of dredge area 1 is further away from the high roost sites. Therefore, re-laying of the mussels is the primary focus of the consideration of disturbance to birds. Mussels will be dredged during a neap high tide. The mussels will be re-laid immediately after removal by washing the mussels off the deck using the deck hose. The mussels will be wash out through the stern of the fishing vessel over the target area.

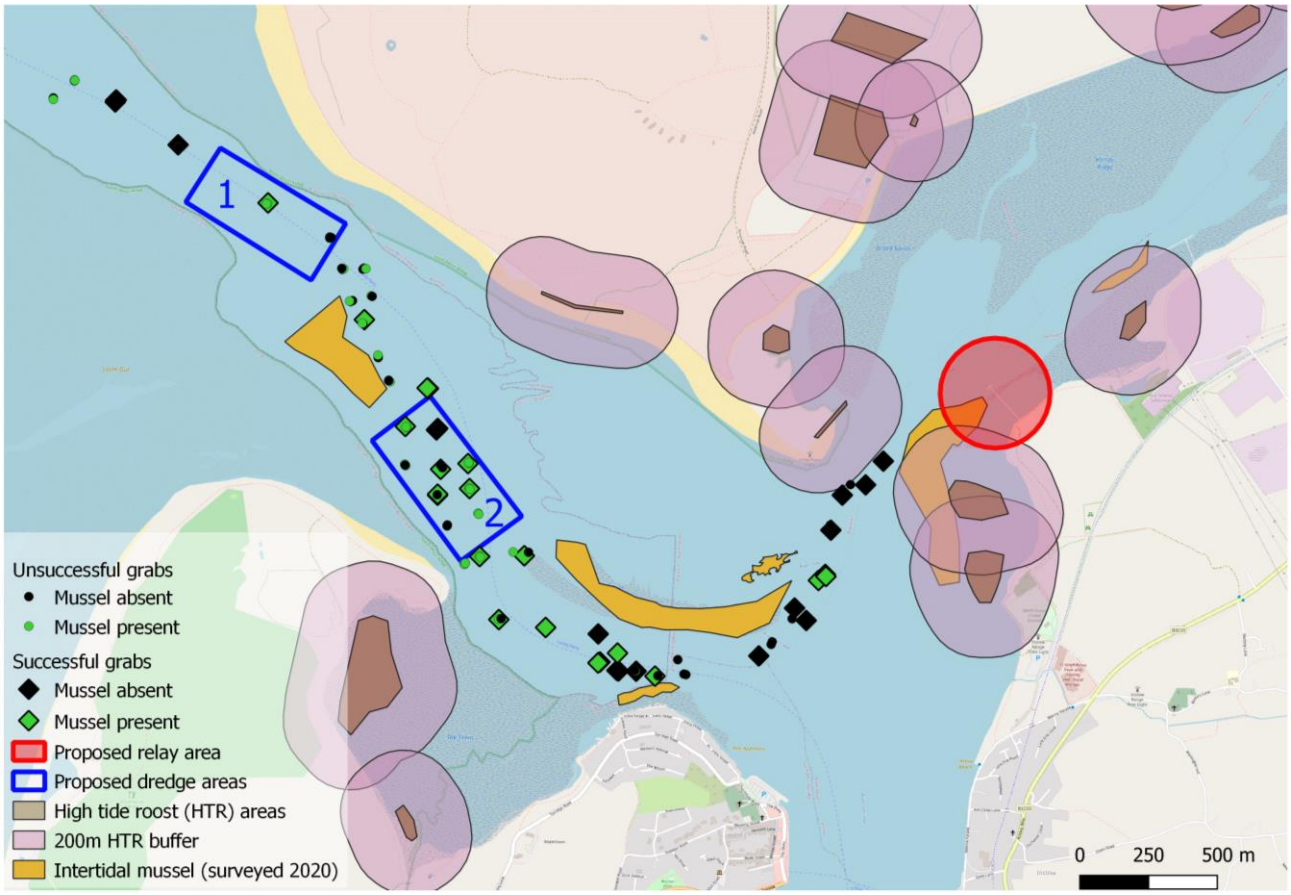

Figure 1a: Map of Taw-Torridge estuary showing proposed dredge areas , proposed re-laying locations (red circle of 150 m radius centred on the Oil Jetty (disused) at 51° 4.092' N 004° 10.824' W), and the high tide bird roosts in the area (brown polygons surrounded by supplementary 200 m buffers). Also shown are the intertidal mussel beds surveyed annually by D&S IFCA (yellow polygons) and the presence/absence of mussels in subtidal areas, as detected in surveys reported in Stewart (2020).

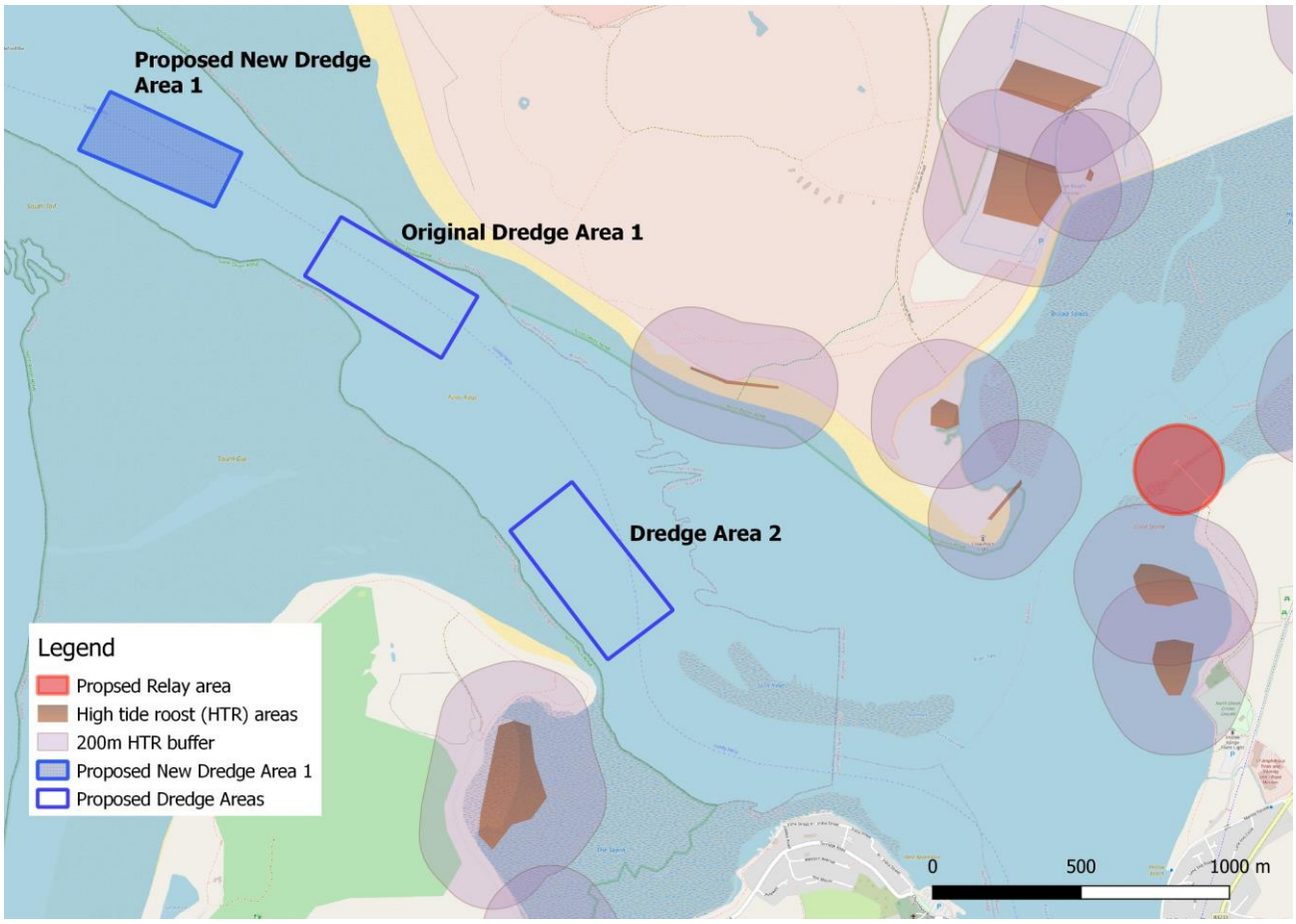

Figure 1b: Map of Taw-Torridge estuary showing the original proposed dredge areas (blue rectangles) the proposed new dredge Area 1 (hatched blue), proposed re-laying locations (red circle of 150 m radius centred on the Oil Jetty (disused) at 51° 4.092' N 004° 10.824' W), and the high tide bird roosts in the area (brown polygons surrounded by supplementary 200 m buffers). Table 3 gives the co-ordinated of these positions of the dredge areas and relaying area.

Table 3. Coordinates specifying the four corners of each proposed dredge area displayed in Figure 1a and b. The proposed re- laying zone shown in Figure 1 is a circle of 150 m radius around a point indicated in table 3 below.

Site	Lat (decimal degrees)	Long (decimal degrees)	Lat (GIS)	Long (GIS)
Dredge Area 2	51° 4.069' N	004° 12.5742' W	51.06783	-004.20957
	51° 3.838' N	004° 12.2826' W	51.06396	-004.20471
	51° 3.748' N	004° 12.471' W	51.06246	-004.20785
	51° 3.981' N	004° 12.753' W	51.06635	-004.21255
Dredge Area 1 (new position)	51° 4.666' N	004° 13.526’ W	51.07777	-004.22543
	51° 4.568’ N	004° 13.605’ W	51.07613	-004.22675
	51° 4.671’ N	004° 13.997’ W	51.07785	-004.23328
	51° 4.777' N	004° 13.906’ W	51.07962	-004.23177
Dredge area 1 (original)	51° 4.2936' N	004° 12.951' W	51.07156	-004.21585
	51° 4.443' N	004° 13.3452' W	51.07405	-004.22242
	51° 4.550' N	004° 13.2402' W	51.07584	-004.22067
	51° 4.406' N	004° 12.846' W	51.07343	-004.2141

Relaying Area (centre of circle - radius 150m)	51° 4.092' N	004° 10.824' W	51.0682	-004.1804

The Taw-Torridge Estuary is included in the Wetland Bird Survey (WeBS), and the area is split into an array of low-tide and high-tide 'sectors'. The mussels will be re-laid near the Oil Jetty, which is within high-tide sector 11483 (Isley to Instow; Figure 2) (Berridge 2019). Areas in the vicinity of this part of the estuary are important for wading birds within the Taw Torridge Estuary system, with the highest counts of oystercatchers during the Autumn and Winter high-tide counts (Berridge 2019). The sector is also important for lapwing and dunlin (Figure 3). There are four high tide roosts within the sector: Isley Marsh, Yelland, and the Black Ground and Cool Stone (Figure 2).

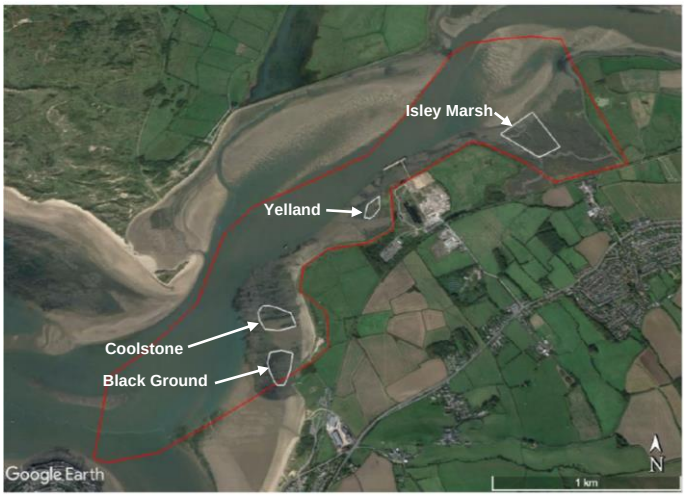

Figure 2. Annotated aerial photograph of WeBS sector 11483 (red boundary), the high tide roosts within it (white boundaries). Adapted from Berridge (2019).

The target area for proposed mussel re-laying does not overlap with any high tide roosts (Figure 1), and the indicative area only marginally overlaps with a 200 m buffer area around the Coolstone roost (Figure 1). This buffer is a precautionary area around the high roost sites, suggested by Natural England in discussions on high roost sites in the Severn Estuary. However, it should be noted that the small indicative area of overlap is relatively high in the intertidal zone (Figure 1), whereas the re-laying is proposed to take place in a much smaller area lower in the intertidal zone and near to the Oil Jetty, north east of the intertidal Coolstone mussels bed (Figure 1). The Black Ground is used preferentially to Coolstone and is becoming the primary oystercatcher roost on the estuary (Berridge 2019). Birds will move to Coolstone if disturbed from the Black Ground (Berridge 2019). Disturbance at both of these sites from walkers, dogs and anglers is frequent (Berridge 2019).

Although boats may cause disturbance, the one-off nature of the re-laying event proposed in this pilot study is unlikely to be significant. In fact, the area around the Oil Jetty is very popular with dog walkers and so feeding or roosting birds are rare in this area (Berridge 2019). This is a pilot study and further relaying activity may occur in the future. However, the level of disturbance caused by an almost static vessel for a limited period whilst relaying is likely to be much less that disturbance caused by members of the public and dog walkers. Fishers and D&S IFCA will manage this single relaying activity and potential future activities to reduce any possible disturbance to the birds feeding and roosting.

The relaying activity may also have some later benefits by providing birds which feed on mussels with an additional food source (contingent upon the development of the bed). In terms of waders this is primarily oystercatchers (Table 4), which are the dominant species at high tide roosts in this

area (Figure 3). The benefits of re-laying in the target areas are potentially large: the target area contains suitable substrate for mussels establishment, but recent observations suggest sparse mussels coverage in target areas around the Oil Jetty (J. Stewart, *pers. obs.*); furthermore, mussel density and percentage cover in the nearby Coolstone intertidal bed is low relative to recent years and relative to other nearby intertidal mussel beds (Thomas, 2019). Re-laying mussels in this area may therefore promote recovery of natural mussel beds, providing additional accessible food for birds at low tide.

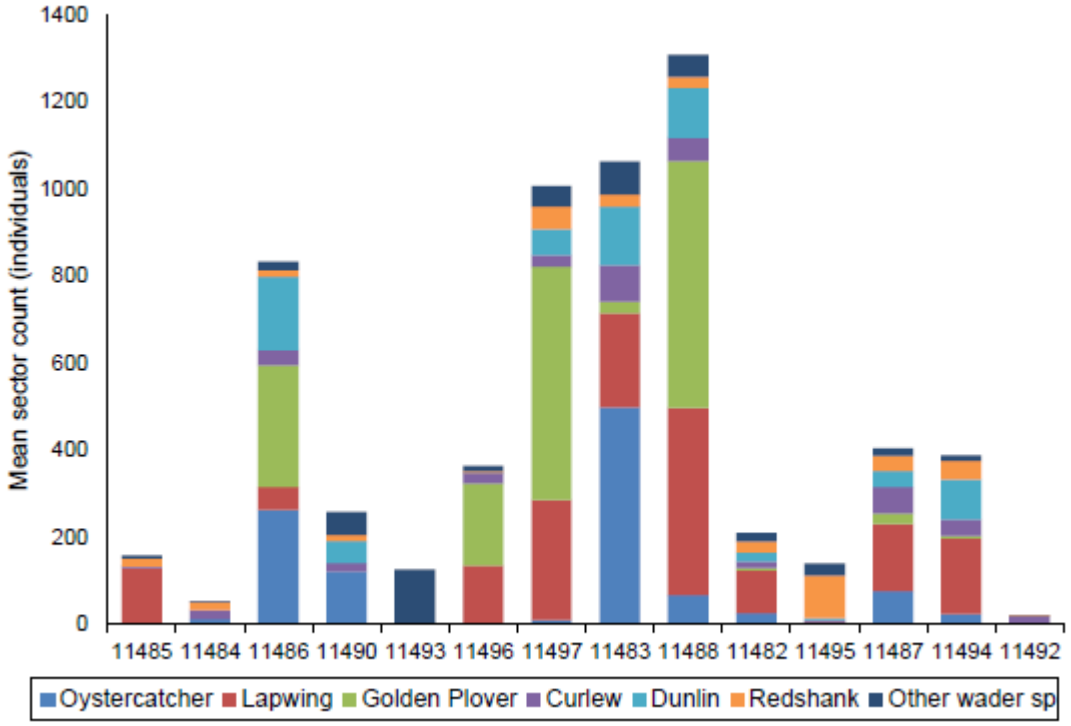

Figure 3. Mean sector counts of waders on WeBS core counts in October to March 2014-18; from Berridge (2019). The proposed relaying activity is in a small area of Sector 11483, which contains the Black Ground, Coolstone, Yelland and Isley Marsh high tide roosts (Berridge 2019). Sector 11483 is shown in Figure 2.

Table 4. Diet of main overwintering wader species in the Taw-Torridge Estuary SSSI

Species	**Diet**	**Mussels a Major Component**
Golden plover, *Pluvialis apricaria*	Invertebrates, especially beetles, earthworms, feeds extensively at night	No
Lapwing, *Vanellus vanellus*	Invertebrates from ground, will feed at night, especially when bright moon	No
Curlew, *Numenius arquata*	Omnivorous, though principally invertebrates located by touch	No
Redshank, *Tringa totanus*	Invertebrates, especially earthworms, cranefly larvae (inland) crustaceans, **molluscs**, marine worms (estuaries)	No
Dunlin, *Calidris alpina*	Invertebrates, located by sight and touch	No
Oystercatcher *Haematopus*	Predominantly bivalves	Yes

ostralegus	especially cockles, **mussels**, tellins *Macoma*, earthworms when young	

6. Can D&S IFCA exercise its functions to further the conservation and enhancement of the special interest features of the SSSI?

Yes

Evidence:
This activity will require an exemption from D&S IFCA's Mobile Fishing Permit Byelaw, in the form of a written Authorisation. This Authorisation can set out specific conditions upon which the Authorisation is granted including, in this case, a requirement under dispensation for the fisher to carry out fishing activities in defined areas (i.e. as set out in Figure 1 and Table 3) and up to a defined quantity of mussels (5 tonnes), to re-lay mussels in certain densities (equivalent to between 40 – 80 tonnes per hectare) and in a defined location (as set out in Figure 1 and Table 3). These conditions are set out in an attempt to minimise impacts on the subtidal mussel beds identified throughout the estuary (Stewart, 2020), minimise disturbance to birds and maximise the potential benefits to birds and intertidal habitats of the re-laying activity.

7. In-combination assessment

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

Plans and Projects		
Activity	**Description**	
No other plans or projects known to be occurring	The impact of future plans or projects will require assessment in their own right, including accounting for any in-combination effects, alongside existing activities.	N/A
Other activities being considered		
Activity	**Description**	**Potential Pressure(s)**
Hand gathering	The intertidal mussel beds in Taw-Torridge Estuary, including those in the area identified for re-laying activities, may be targeted for commercial harvesting (hand-gathering) to a maximum of 500 kg per month, under a management agreement developed by Natural England and D&S IFCA.	Abrasion/Penetration and/or disturbance of the substrate Removal of target species

Typically, hand gathering activities have the potential to alter the distribution and composition of intertidal sediment communities through abrasive impacts of the activity or access. In addition, excess removal of target species risks depleting food supplies for overwintering birds. The responses of shorebird species to insufficient food supplies (target species) during the overwinter period include reduced individual body condition, increased mortality and reduced population sizes (Stillman et al., 2015).

However, exposure to hand-gathering activities is thought to be low, and the cap on commercial harvesting has been set at a limit agreed by Natural England and D&S IFCA which accounts for the feeding requirement of the bird populations. Furthermore, the dredging and re-laying trial activity is being carried out to increase the extent and density of intertidal blue mussel beds. Therefore, D&S IFCA concludes there is no likelihood of significant adverse effect on the interest features from in-combination effects addressed.

8. NE consultation response

N/A

9. Conclusion

D&S IFCA has undertaken an assessment of the impacts of removing sub-tidal mussels and relaying to a small area around the Oil Jetty on the features of the Taw Torridge SSSI. D&S IFCA concludes that the trial pilot study described in this assessment will not have an adverse effect on the features of the SSSI.

10. References

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Annex 1: Site Map(s)

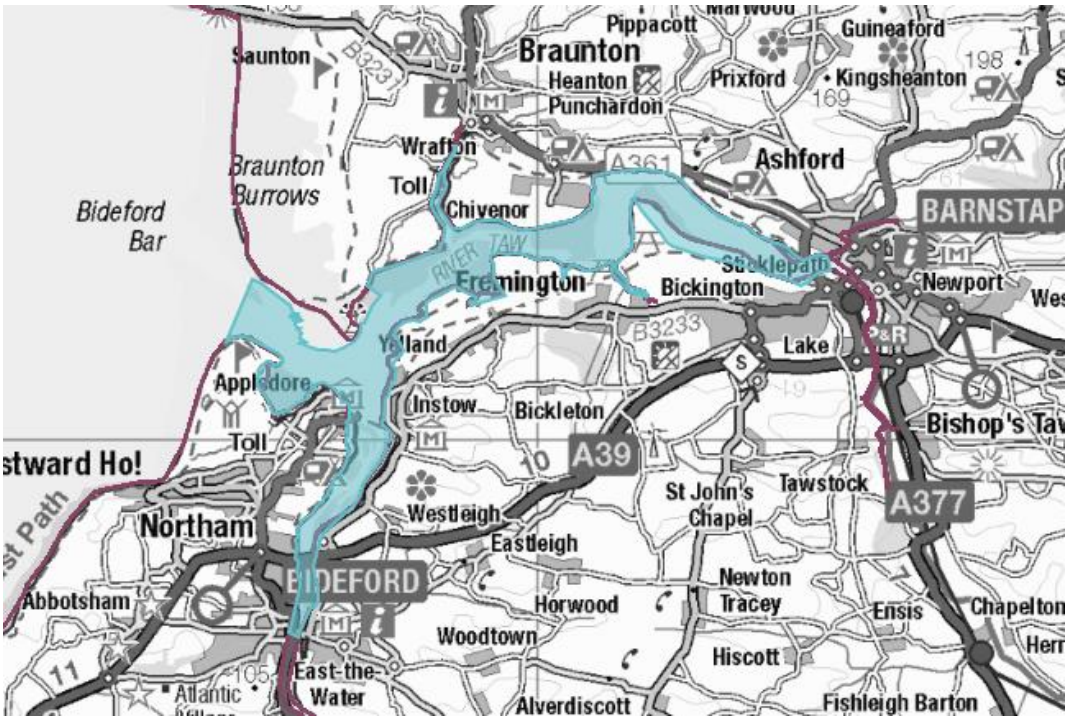

Figure 1 – Taw-Torridge Estuary SSSI