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-002

Contents

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 study to trial the removal of a limited quantity of subtidal mussels and subsequent intertidal relaying of those 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 stones on the banks	Blue mussels *Mytilus edulis*

Due to natural fluctuations in the bird assemblage over time, any native wetland bird species can be considered part of the bird assemblage (Natural England 1998).

4. Activities under consideration

This assessment is considering the risk of a trial 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 study being considered here is an important part of that process.

The mussels will be fished using a traditional Baird mussel dredge of 1m width. Figure 1 shows the two proposed areas of removal, in the central channel downstream of Sprat Ridge and in the estuary mouth. As a small-scale trial, up to ten 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 early winter of 2021-22 in an attempt to utilise the ephemeral resource before it is removed by winter storms or in periods of high freshwater flow from the rivers. Anecdotal reports suggest there has already been some natural removal of mussels by such processes during October 2021.

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 distinct age classes of mussels are thought to exist in subtidal areas of the Taw-Torridge Estuary that were surveyed in 2020 and 2021 but these age classes rarely co-exist at fine spatial scales (Stewart, 2020; Parkhouse et al., 2021), which supports an assertion of ephemerality of these beds (Stewart, 2020; Parkhouse et al., 2021). In particular, in 2021 small mussel ~ 10–22mm was only found in the Sprat Ridge to Pulleys area, but was not found in other areas or in 2020. In October 2021, D&S IFCA surveyed the subtidal mussel beds in the Taw-Torridge using side scan sonar, ground-truthed with a Day grab (Parkhouse et al., 2021). Evidence from this survey builds on that of

Stewart (2020); together, this evidence will form a baseline for subsequent monitoring of the subtidal mussel resource post-dredging.

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 (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 on average 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 species in the notification also feed on other organisms (Table 2, below) and are unlikely to rely on the ephemeral subtidal mussels.

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 zones are 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 ten tonnes. Mussel 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 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 (Henly, 2021).

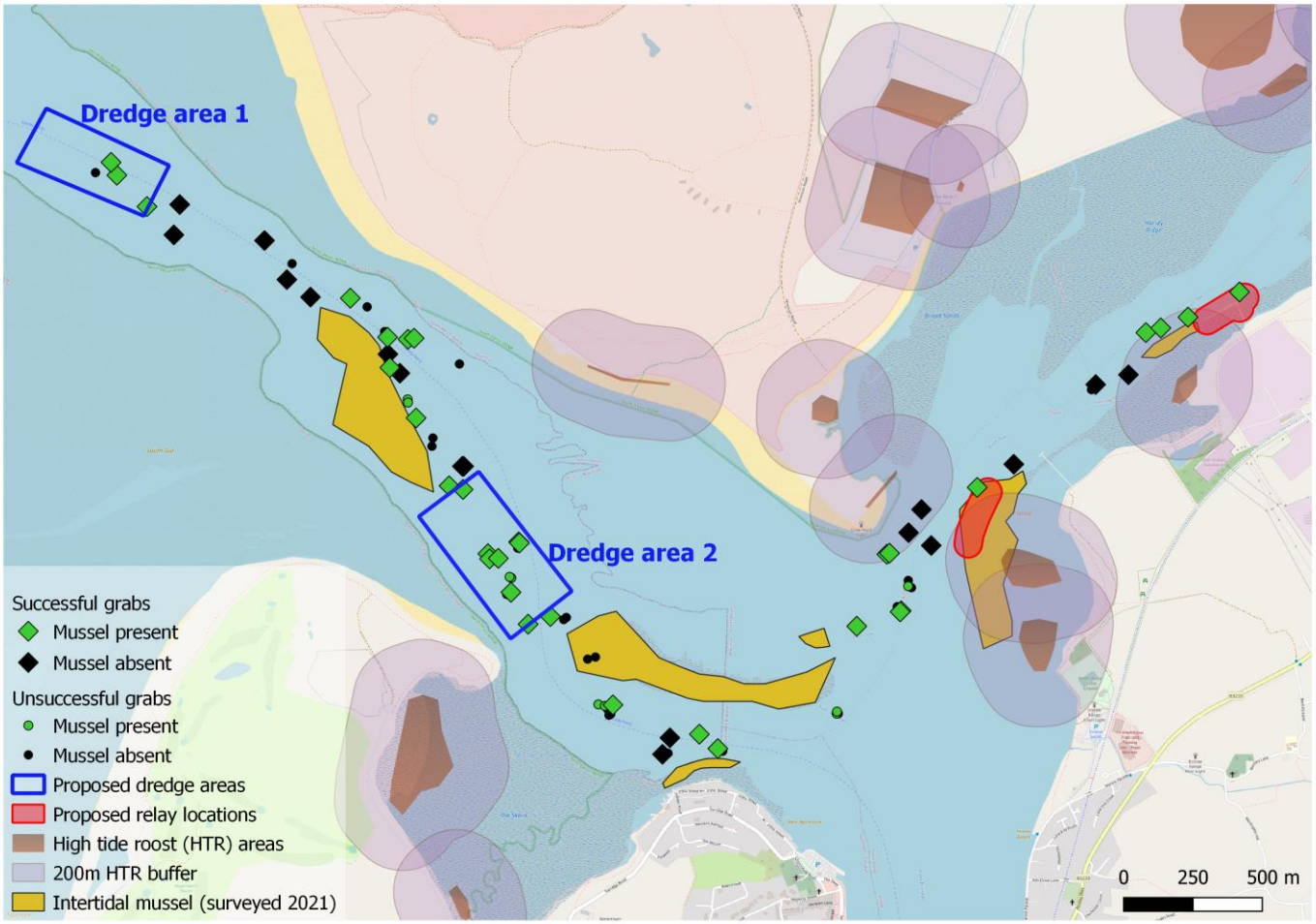

Figure 1: Map of Taw-Torridge estuary showing proposed dredge areas (blue), proposed re-laying locations (red, and the high tide bird roosts in the area (brown polygons surrounded by supplementary 200 m buffers). Also shown are the intertidal mussel beds surveyed annually by D&S IFCA (yellow polygons) and the presence/absence of mussels in subtidal areas, as detected in surveys reported in Parkhouse et al. (2021).

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 trial is unlikely to have a negative impact on nearby beds. Furthermore, the target areas contain suitable substrate for mussel establishment, but recent observations suggest sparse mussel coverage in target areas around the Yelland Quay jetty and the edge of the Coolstone intertidal mussel bed (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 (Henly, 2021); re-laying mussels in this area may therefore promote recovery of natural mussel beds. A previous pilot trial of this method on the Taw-Torridge appears to have been successful: anecdotal information and a recent survey (Figure 2) suggests that the mussel relaid at the Oil Jetty has successfully established.

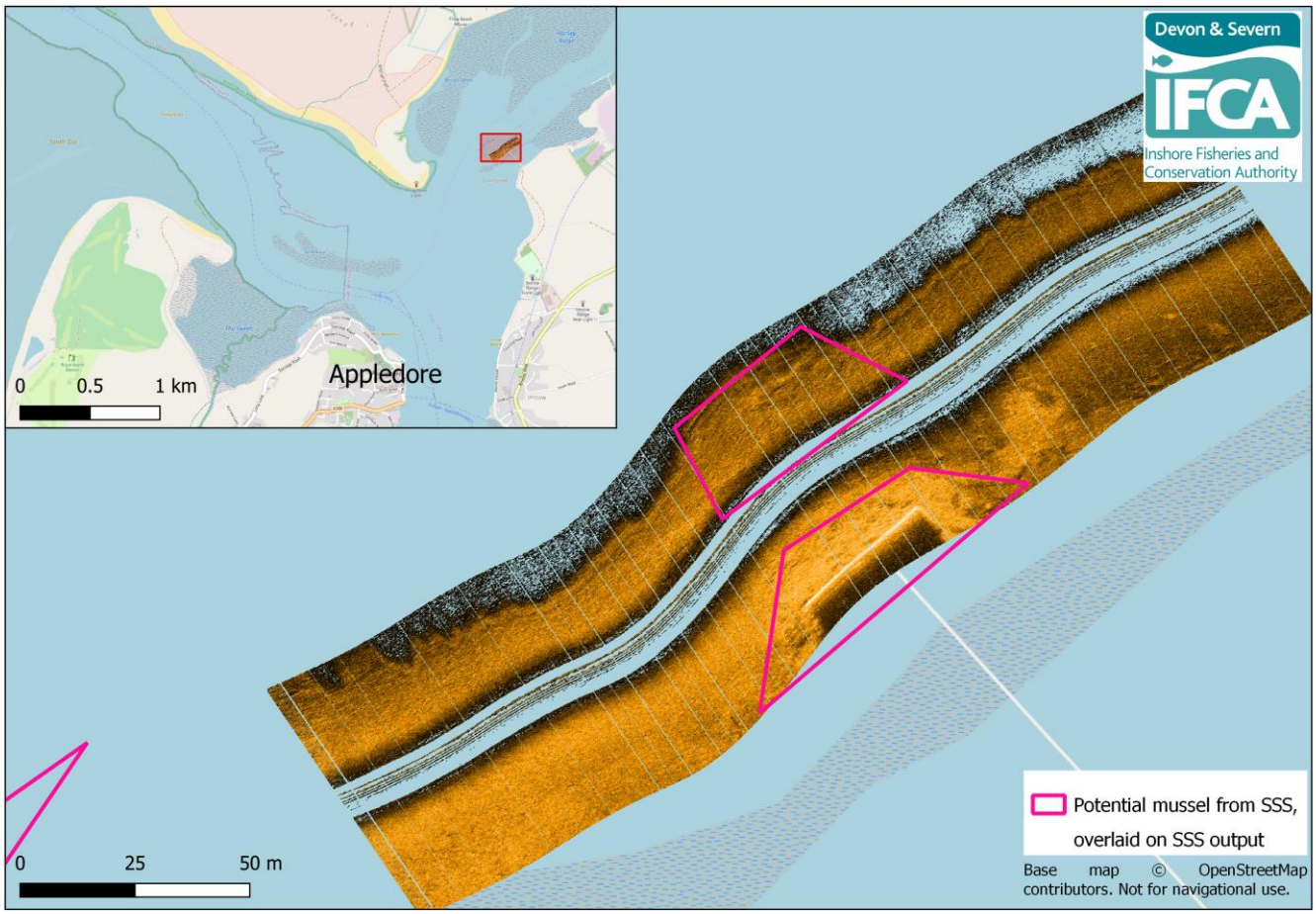

Figure 2. Extract from side scan sonar (SSS) data gathered from the Taw-Torridge in October 2021, reported in detail in Parkhouse et al. (2021). This extract focuses on the area at the end of the Oil Jetty, where mussel appears to have established following the pilot relaying trial in early 2021. The SSS signature, which has been identified (ground-truthed) as mussel by grab surveys, has raised areas with light and dark shadowing which indicates the uneven surface of the mussel bed when compared to flatter sediments. Local knowledge and the ground truthing allow the reviewer to differentiate between the mussel and other hard substrates.

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 1). Neither dredge area is in close proximity the high roost sites (Figure 1). 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 washed out through the stern of the fishing vessel over the target area.

Table 3. Coordinates specifying the four corners of each proposed dredge area displayed in Figure 1.

Site	Lat (decimal degrees)	Long (decimal degrees)	Lat (GIS)	Long (GIS)
Dredge Area 1	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 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

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 Yelland Quay Jetty and the Coolstone intertidal bed, which are 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).

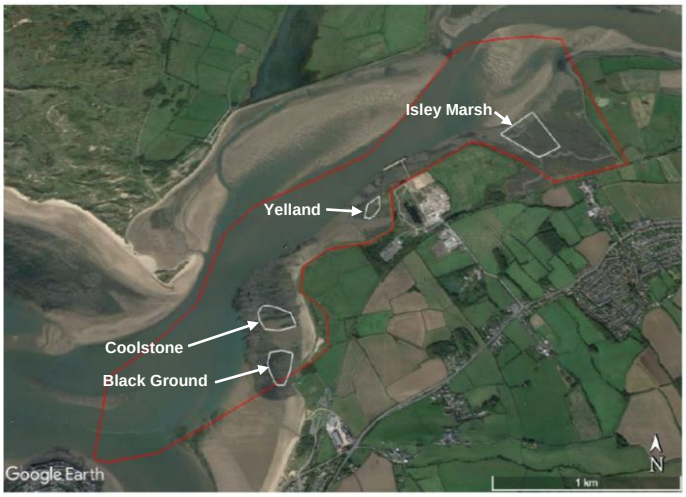

Figure 3. Annotated aerial photograph of WeBS sector 11483 (red boundary), the high tide roosts within it (white boundaries). Adapted from Berridge (2019).

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 the 200 m buffer areas around the Yelland and Coolstone roosts (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 high in the intertidal zone (Figure 1), whereas the re-laying is proposed to take place in a smaller area lower in the intertidal. 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, and disturbance at both of these sites from walkers, dogs and anglers is frequent (Berridge 2019).

Although boats may cause disturbance, the short-term, water-based nature of the proposed re-laying event is unlikely to be significant. In fact, the area around the Oil Jetty and near Coolstone is popular with dog walkers and so feeding or roosting birds are rare in this area (Berridge 2019). This is a trial 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 than disturbance caused by members of the public and dog walkers. Fishers and D&S IFCA will manage the 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 an additional food source to birds which feed on mussels (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 4). 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 (J. Stewart, *pers. obs.* and *pers. comms*. with local fisher); 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 (Henly, 2021). Re-laying mussels in this area may therefore enhance the natural mussel beds, providing additional accessible food for birds at low tide.

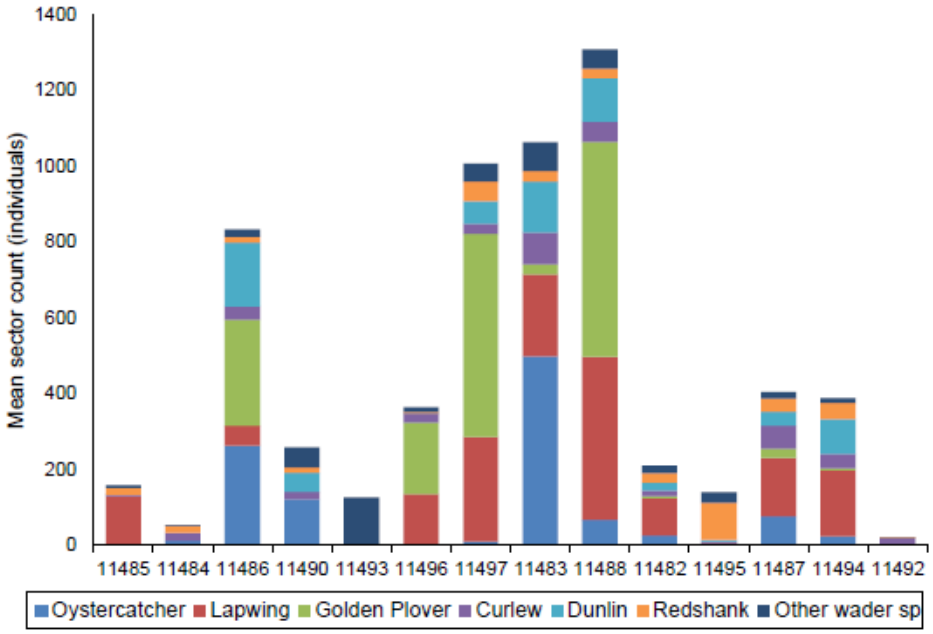

Figure 4. Mean sector counts of waders on WeBS core counts in October to March 2014-18; from Berridge (2019). The proposed relaying activity is in a small area of Sector 11483, which contains the Black Ground, Coolstone, Yelland and Isley Marsh high tide roosts (Berridge 2019). Sector 11483 is shown in Figure 3.

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 ostralegus*	Predominantly bivalves especially cockles, **mussels**, tellins *Macoma*, earthworms when young	Yes

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 (10 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 5 - 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 750 kg per month, under a management agreement developed by Natural England and D&S IFCA. The maximum monthly harvest was previously 500kg, but has been raised to the 750kg given the overall availability of mussel, including relative to the ecological requirements of the overwintering birds. This uplift is to be revisited following future surveys of the intertidal mussel beds and/or if required following a review of the model of the ecological requirements of the birds.	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

A similar proposal was submitted in December 2020, for a similar level of activity in similar locations. Natural England's advice agreed that the proposal is not likely to negatively impact the features of the Taw Torridge Estuary SSSI and is consistent with D&S IFCA's statutory duty to conserve and enhance them. The assent is included as Annex 2 to this document.

Natural England have not yet been consulted regarding the current iteration of this assessment.

9. Conclusion

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

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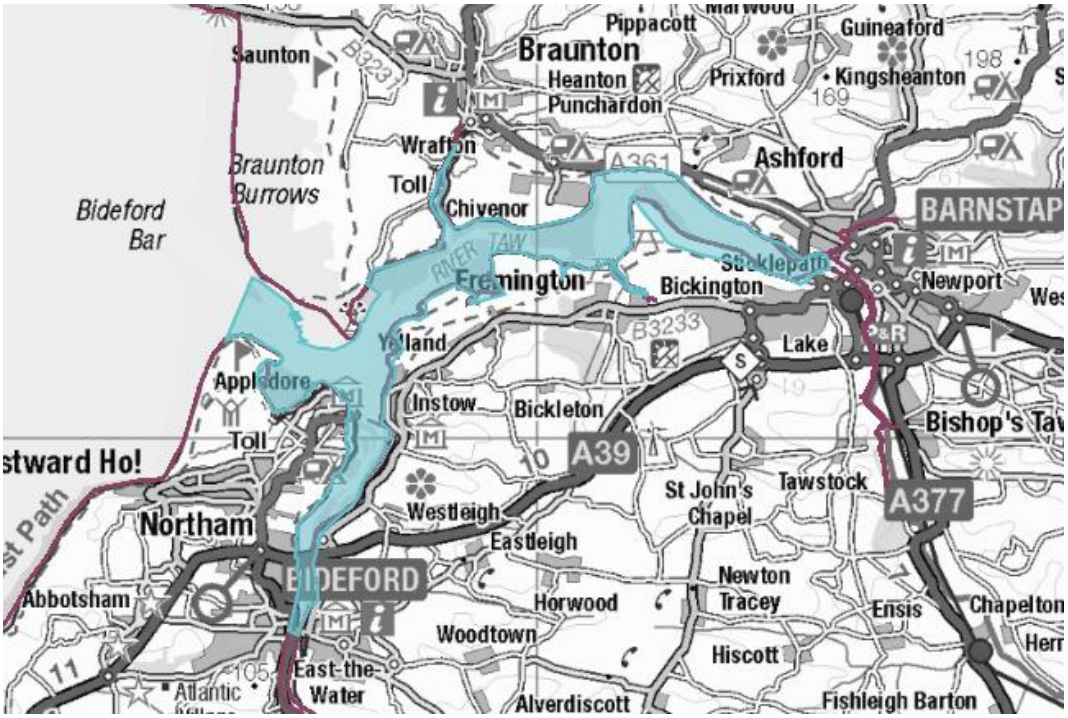
Annex 1: Site Map(s)



Annex 1, Figure 1 – Taw-Torridge Estuary SSSI

Annex 2: Natural England response to SSSI Assessment in 2020

Date: 10 December 2020
Our ref: 336888
Your ref: TTE-3SI-001

Hornbeam House
Crewe Business Park
Electra Way
Crewe
Cheshire CW1 6GJ

T 0300 060 3900

BY EMAIL ONLY

Dear Sarah

Taw Torridge Estuary SSSI
ASSENT OF NATURAL ENGLAND UNDER SECTION 28H OF THE WILDLIFE AND COUNTRYSIDE ACT 1981 (AS AMENDED)

Natural England assents to the operations specified in your notice of 08.12.2020 under S28H of the Wildlife and Countryside Act 1981 (as amended) as attached.

This assent covers the period 10.12.2020 – 31.01.2021.

Please note the important information about this assent below.

I draw your attention to your duty, under section 28G of the Wildlife and Countryside Act 1981, as inserted by the Countryside and Rights of Way Act 2000, to take reasonable steps, consistent with the proper exercise of your functions, to further the conservation and enhancement of the SSSI.

As discussed, it would be good practice to advise anyone requesting permission to harvest the newly laid intertidal mussels about the locations of the nearby high tide bird roosts so that they can be avoided when accessing the site.

In addition, monitoring the intertidal and subtidal success of the pilot in its first year is advised. Natural England would be very interested in the results of any such monitoring.

For any queries relating to the content of this letter please contact me using the details provided below.

Yours sincerely

Melanie Parker,
Lead Adviser – Devon Cornwall and Isles of Scilly Team
E-mail: melanie.parker@naturalengland.org.uk
Telephone: 07825 605585

Important information about this assent

If you wish to change the proposed operations or their location or to carry out additional operations for which assent has not yet been given, or if a time period set out above has expired, you must give further written notice to Natural England. Before doing so, you can seek advice from Natural England.

You may face enforcement action if you undertake unauthorised operations which destroy, damage or disturb the notified features of special scientific interest.

Before undertaking the operations specified in this assent, you may also need to get additional permissions from other authorities. For example, the assented operations might also require planning permission from the Local Planning Authority, a permit from the Environment Agency or a licence from the Forestry Commission. It is your responsibility, as the grantee of this assent, to ensure that no other permissions or consents, whether of a public or a private nature, are needed and, if any are needed, to acquire them before you exercise this assent.

This is Natural England's assent only, and it does not allow you to undertake the specified operations without first having obtained all of the necessary permissions needed to undertake the operation lawfully. If you do not obtain all of the permissions you require, and carry out the work anyway, you may face enforcement action from other authorities or parties.

As the grantee of this assent, you are responsible for carrying out the assented operation(s) safely and in all ways according to the law.