

Habitats Regulations Assessment document: NCSPA – tLSE 037

European Marine Site:	Northumbria Coast SPA
Generic sub-feature(s):	Estuarine Birds, Intertidal Sand
Gear type(s):	Digging with forks
NIFCA tLSE type:	Detailed
Gear/feature interaction reference(s):¹	NCSPA – 273 NCSPA – 274

Revision history		
<i>Date</i>	<i>Revision</i>	<i>Editor</i>
13/08/2018	Document created	AA
18/09/2018	Document progressed.	NW
18/06/2019	Section 4.	NW
30/11/2020	Document revised. Sections 5, 6 and 7, Annexes.	BH
03/02/2022	Document checked with NE.	CS BH AA
23/02/2022	Document revised. Intertidal sand and muddy sand added as supporting feature.	BH
30/11/2022	Document reviewed with NE and estuarine bird assessment agreed.	CS AA BH
27/07/23	Document agreed	CS AA

Has Natural England been formally consulted on this tLSE (and do they agree)?	Yes
--	------------

Date of document completion/'sign-off':	27/07/23
--	-----------------

Test for Likely Significant Effect (LSE)

NCSPA – 273: Estuarine Birds (purple sandpiper and turnstone)

<p>1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?</p>	<p>No</p>
<p>2. What pressures (such as abrasion, disturbance) are potentially exerted by the gear type(s)?</p> <p>Pressures listed are all those for which the feature is deemed to be sensitive. Pressures in bold are Medium-High Risk. The sensitivities listed are based on the 2020 conservation Advice available on Natural England's Designated Site System</p>	<p>Removal of non-target species</p> <p>Visual disturbance</p> <p>Above water noise</p> <p>Collision ABOVE water with static or moving objects not naturally found in the marine environment (e.g., boats, machinery, and structures)</p> <p>Introduction of light</p> <p>Litter (insufficient evidence)</p>
<p>3. Is the feature potentially exposed to the pressure(s)?</p>	<p>Yes</p>

4. What are the conservation objectives for the feature?

The conservation objectives that might be affected by bait digging are underlined.

The conservation objectives for designated estuarine bird feature(s) are set to:

Maintain*:

- safe passage of birds moving between roosting and feeding areas.
- concentrations and deposition of air pollutants
- the structure, function and supporting processes associated with the feature and its supporting habitat through management or other measures (whether within and/or outside the site boundary as appropriate) and ensure these measures are not being undermined or compromised.
- the extent, distribution and availability of suitable habitat (either within or outside the site boundary) which supports the feature for all necessary stages of the non-breeding/wintering period (moulting, roosting, loafing, feeding)
- the distribution, abundance and availability of key food and prey items (eg. *Balanus*, *Mytilus*, *Carcinus*, *Gammarus*, *Littorina*, dipteran flies, kelp-fly larvae for Turnstone and *Mytilus*, *Littorina*, *Nucella*, kelp fly larvae for purple sandpiper) at preferred sizes.
- the area of open and unobstructed terrain around roosting and feeding sites.
- a vegetation structure of key roost sites dominated by bare ground or a short sparsely-vegetated sward.
- the dissolved oxygen (DO) concentration at levels equating to High Ecological Status (specifically $\geq 5.7 \text{ mg L}^{-1}$ (at 35 salinity) for 95% of year), avoiding deterioration from existing levels.
[ASSESSED UNDER SUPPORTING HABITAT FEATURE]
- water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.
- natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat. [ASSESSED UNDER SUPPORTING HABITAT FEATURE]

Restrict/restore/reduce:

- Restrict the frequency, duration and / or intensity of disturbance affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.
- Restore the size of the non-breeding population, whilst avoiding deterioration from its current level

	<p>as indicated by the latest mean peak count or equivalent.</p> <ul style="list-style-type: none"> - Reduce aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.
<p>5. What are the potential effects/impacts of the pressure(s) on the feature, taking into account the exposure level?</p>	<p><u>Protected features</u></p> <p>The protected estuarine bird species of Northumbria Coast SPA are ruddy turnstone (<i>Arenaria interpres</i>; hereafter, turnstone) and purple sandpiper (<i>Calidris maritima</i>). Nationally and within the North East region, turnstone populations are experiencing long-term declines, having previously increased. This matches trends within the Northumbria Coast SPA. Numbers of purple sandpiper over-wintering in Great Britain have been stable in the medium-term having previously declined, while in the region and SPA numbers follow the same trends but have been increasing in the medium term (around the last 10 years).</p> <p>The trends in both species on the site appear to be tracking that of the region and British trends. The increasing proportion of regional (and even country-wide numbers of purple sandpiper) supported by this site suggest the environmental conditions remain relatively favourable and that this site is becoming increasingly important for this species. In conclusion, the similarity between the declining site trend and the regional and British trends suggests that the long-term declines result from broad-scale population trends (Frost et al., 2020).</p> <p>However, site-specific pressures may contribute to their local declines and these species are becoming more reliant on SPAs to protect them. Purple sandpipers are vulnerable to disturbance and climate change (BirdLife International, 2020). The southern edge of their range is in the UK therefore UK habitat will become less suitable and they are particularly vulnerable to local declines due to climate change (Hayhow, 2017). There are regional differences in declines with greater along the east and south coasts compared to the north and west coasts, linked to the origins of wintering birds (those on the east coast breed in Norway). Poor recruitment in Canada may be the cause of the decline in birds in the Moray Firth (Summers et al., 2012) but there is little additional demographic information about the Norwegian population (Summers, 2014). The WeBS 2018/19 Annual Report states that 'UK declines and distribution changes of wintering Purple Sandpiper are consistent with shifts</p>

towards breeding grounds in northern Scandinavia' (Frost et al., 2020).

The declines in counts of Turnstone from sites within the Northumbrian coast could be explained by shifts in where birds are wintering, and/or declines in breeding productivity (Hayhow, 2017). These could be due to a range of factors including changes in food abundance/availability (Burton et al., 2005, Burton & Goddard 2006), climate change altering winter temperatures across the east Atlantic flyway (Austin & Rehfisch 2005, Mieszkowska et al. 2006, Pearce-Higgins & Holt 2013), and local factors such as changing sewage treatment and disposal practices (Hayhow, 2017).

Excessive disturbance can also prevent the use of high tide roosts for both species, which causes energetic costs and can reduce survival rates (Smit & Visser, 1993; Navedo & Herrera, 2012; Rehfisch et al. 1996) and could therefore be a local cause of decline (Whittingham et al. 2019).

Bait digging within the Northumbria Coast SPA

The site consists of mainly discrete sections of rocky shore with associated boulder and cobble beaches (Annex 1; see also Annex 3). The sub-features intertidal rock and infralittoral rock cover 66% of the protected area. The SPA also includes parts of three artificial pier structures, including at River Tyne South Pier and Seaham Harbour which are outside the NIFCA district. The site has small sections of sandy beach and discrete areas of estuarine intertidal mudflats and sand flats.

Bait digging occurs in areas of intertidal mud and areas of sand and muddy sand. Intertidal mud is formed in sheltered coastal inlets, allowing fine sand, silts and clay to accumulate, and supports a diverse community dominated by bivalves and polychaete worms such as lugworms, which are targeted by bait digging. Intertidal mud is not a significant sub-feature, only covering 0.03% of the site.

Sand and muddy sand covers 24% of the SPA, however not all of this area is appropriate for bait digging. Pure sandy shores are highly mobile and species poor, often dominated by polychaete and oligochaete worms, ephemeral green macroalgae and amphipod communities which are resilient to the clean, abrasive and mobile environment. Where sandy shores occur in more sheltered locations, muds and silts can accumulate, forming muddy-sand which allows the features to support a much wider and diverse community, including burrowing infauna such as lugworm. Bait digging is more

likely to occur in these sheltered areas which do not cover a significant proportion of the SPA.

Purple sandpiper spends the nonbreeding season (Autumn/Winter) on rocky coasts while turnstones can be found on rocky and shingle shores, sandy beaches, estuaries and mudflats (Goodship & Furness, 2019). Bait collection activities are therefore more likely to overlap with turnstones feeding and/or roosting sites.

Bait digging activity is concentrated in the winter months which is the period of greatest demand for lugworm as angling bait (NIFCA, 2014). Spring tides are favoured as a larger area of shore is exposed, and the body size of lugworms is thought to increase lower down the shore (Tinlin-Mackenzie, 2018). Some collection does occur at neap tides but at a lower frequency and intensity, with some known commercial operators collecting at all tidal states despite conditions not being ideal (Tinlin-Mackenzie, 2018). Bait digging activities in winter correspond with overwintering bird presence: the key months for turnstone on the Northumberland coast are August-May and for Purple Sandpiper are October to April.

NIFCA officers record sightings of intertidal bait collection activity observed during routine patrols when a site visit coincides with low water (± 2 hours). Between 2016 and November 2021, 184 patrols were made to locations within the Northumbria Coast SPA and bait digging was observed on 20% of patrols. A total of 143 bait diggers were observed with a mean of 2.9 individuals for each sighting.

Maps of bait digging activity based on NIFCA sightings within the Northumbria Coast SPA (Annex 2 and 3) show that overall bait digging does not occur throughout most of the SPA. Sightings within the NC SPA occurred at: Boulmer Haven, Cambois, Cresswell, Hadston and Hauxley, and from Seaton Sluice to St Mary's lighthouse. Annex 2 maps show that many bait digging sightings in those hotspot areas are not within SPA boundaries, because the SPA mainly covers areas of intertidal rock with fewer sandy areas. At Hauxley, most sightings are in the sandy area outside two sections of the SPA though some are within the SPA. Boulmer is the exception, with a high number of bait digging sightings within the Northumbria Coast SPA all of which are concentrated in the sandy beach area. There is regulation in place in Boulmer that prohibits bait digging on the northern section of the sandy beach area. Bait digging also occurs at Newton and the north end of Whitley Bay in the vicinity of the SPA.

These maps also further highlight the separation between habitat suitable for bait digging (sand and muddy sand) and the intertidal rocky areas mainly used by the estuarine bird features.

A PhD was conducted to assess bait collection and hand gathering activity and impacts within the Berwickshire and North Northumberland Coast (BNNC) SAC (Tinlin-Mackenzie, 2018), parts of which overlap with the northern sections of the Northumbria Coast SPA. Annex 4 shows modelled suitability maps for lugworm collection where the modelled output is within SPA boundaries, confirming Boulmer and Newton as collection hotspots and revealing additional potential bait digging areas between Seahouses and Beadnell. NIFCA patrol sightings to date have shown that there is no activity, but these areas are not patrolled as often as others. Expert knowledge suggests that activity in these locations is low (NIFCA officer, pers. comms.).

The distribution, abundance and availability of key food and prey items (eg. *Balanus*, *Mytilus*, *Carcinus*, *Gammarus*, *Littorina*, dipteran flies, kelp-fly larvae for turnstone and *Mytilus*, *Littorina*, *Nucella*, kelp fly larvae for purple sandpiper) at preferred sizes.

The diet of turnstones is extremely diverse, ranging from coastal invertebrates to small fish, carrion, discarded human food, and unattended eggs of other avian species (del Hoyo et al., 1996; Nettleship, 2000). The diet is 7% bivalves, 46% intertidal annelids (small worms), and other invertebrate species including *Carcinus* spp., *Gammarus* spp.; *Balanus* spp, *Mytilus edulis*, *Littorina* spp; and *Diptera* larvae (Woodward et al., 2015). They feed on seaweed covered rocks on the rocky shore, congregating at high tide to roost on the mainland shore or continue to feed on banks of washed up seaweed on the strand line along sandy and muddy shores.

The purple sandpiper's diet is less varied and they are almost entirely restricted to the rocky shore (Feare, 1996). Analysis of the gut contents from eastern and northern Scotland showed that most of the diet at low tide consisted of molluscs, particularly littorinids (winkles), but also *Mytilus edulis* (mussels), *Nucella lapillus* (dogwhelks) and *Rissoa interrupta*. Crustaceans, annelids and algae were also eaten (Summers et al., 1990). Purple Sandpipers do not need to carry fat reserves in winter like other waders wintering in central and western Europe (Dierschke, 1993).

Bait digging has the potential to reduce the abundance of bird prey species, through the reduction in infaunal invertebrate biomass or size after sediment turnover / digging (Van den Heiligenberg, 1987; Bowgen et al., 2015). How much birds are impacted by these alterations in food supply will depend upon the ability to switch prey and/or foraging area, as well as environmental factors and the intensity of harvesting (Masero *et al.*, 2008). Alternatively, a positive impact from sediment turnover is that it can bring infauna to the surface where it is more vulnerable to predators including birds, making prey species more accessible after the bait digging has ceased (Tinlin-Mackenzie, 2018).

Bait digging only occurs on intertidal soft sediments while purple sandpiper predominantly feed on the rocky shore, therefore digging activity is unlikely to overlap with foraging for prey. Turnstones feeding on sandy and muddy shores where bait digging could occur do not target the same species as digging (lugworms *Arenicola* spp.) therefore digging will not impact prey availability directly. Bait digging can have indirect impacts on sediment invertebrate communities because of reduced lugworm availability and habitat alterations such as sediment turnover and reduced organic content within the sediments (Fowler, 1999; Watson et al., 2017). However, infaunal invertebrates are not targeted by turnstones therefore this is unlikely to impact on prey availability.

Tinlin-Mackenzie (2018) stated that there are no potential impacts of feeding disturbance or loss of prey to purple sandpipers from bait digging, but that turnstones could be impacted by both. However, the wide variation in turnstone prey from different foraging areas means they will be resilient to reductions in any individual prey item and can forage elsewhere so are unlikely to suffer a reduction in prey availability solely due to bait digging in the NC SPA.

Restrict the frequency, duration and / or intensity of disturbance affecting roosting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed.

Bird disturbance is considered one of the most serious impacts of bait collection in British estuaries over winter (Davidson and Rothwell, 1993). Disturbance by bait collection generally occurs via visual (seeing the collector and responding as if they were a potential predator) and/or noise disturbance (causing distress via deviation from the “natural” ambient noise).

Disturbance leads to birds searching for new feeding areas, increasing energy expenditure and food competition, and ultimately increasing winter mortality rates in some cases because they are already under stress from low temperatures (West et al., 2002; Masero et al., 2008). Lost feeding time due to disturbance can be compensated by extended feeding times or habituation to the presence of people (Urfi et al. 1996) however it is unlikely all species can compensate. Disturbance can influence breeding success through several factors e.g. nest abandonment, increased mortality of eggs due to predation and increased mortality of young through reduced feeding (Hockin et al. 1992).

Excessive disturbance can prevent the use of roosts (Smit & Visser 1993, Navedo & Herrera 2012). Previous work has suggested that as few as ten disturbance events at a high tide roost are sufficient to prevent individuals from meeting their daily energy requirements, and therefore impacts on survival or body condition are likely to follow if disturbance is chronic (Rehfishch et al. 1996, Rogers et al. 2006). Roosts at high tide are most vulnerable as there is the smallest area of shore and the least choice of sites available to the birds. Depending on the proximity of these sites to areas used by people, who similarly have the smallest area of shore and least choice of locations to walk at high tide, some sections of SPA could be far more vulnerable to disturbance at high tide than others.

Peak bait worm demand in winter coincides with the presence of overwintering and migrating populations of wildfowl and waders with international importance (Townshend and O'Connor, 1993). Diggers can disturb the feeding activities of birds over many thousands of meters, causing a 'temporary loss of habitat' (Watson et al., 2017) and making the most frequently used shores almost permanently unsuitable for birds (Van den Heiligenberg, 1987).

However, the response to human disturbance differs between species. Golden Plovers (Smit & Visser 1993, Pearce-Higgins et al. 2007) and oystercatchers (Van Der Vliet et al 2010) for example are fairly tolerant, but Curlew and Redshank tend to take flight at more than twice as great a distance (Smit & Visser 1993). Response to human disturbance also differs in the same species between different places, or in the same individual at different times (for example, newly arrived migrants might not be habituated and therefore be more vulnerable). As response to disturbance varies between species and location, it is not possible to give standard figures on flight distances caused by disturbance as these vary

between sites and are dependent on earlier experiences in each particular location. For example, some Dunlins can be approached to within 0-20m in areas of high disturbance, but at the same time of year the same species feeding on open mudflats may take flight at a distance of 100-200m (Smit & Visser 1993).

Purple sandpipers wintering in Hartlepool West Harbour declined two winters after re-development of the site probably caused by increased human disturbance (people, boats) (Burton et al 1996). Purple sandpipers have strong site-fidelity, putting them at greater risk of changes such as disturbance to wintering feeding areas (Mittelhauser et al., 2012). However, some studies show that this species has a low sensitivity to human disturbance. Purple sandpiper has been described as 'tends to be very confiding' and 'not so readily disturbed as other waders' (Brown & Grice, 2005). This species can also be attracted to people including shellfish pickers on the beach (Bolam, 1912) and high levels of human activity around harbour walls and jetties (Prater, 1981). An SNH Report (Goodship & Furness, 2019) concluded that 'as purple sandpiper displays a high tolerance to human activity, the potential for disturbance at roost sites during hand-harvesting seaweed is low', although they noted there were no quantitative studies on purple sandpiper disturbance so they were not confident in this assessment.

The report by Goodship & Furness (2019) assessed turnstones to have a higher (medium) sensitivity to disturbance than purple sandpiper, with more quantitative evidence showing a maximum Flight Initiation Distance (FID) of 100m during the nonbreeding season (with mean FID ranging from 12.5-31.5m), concluding 'this species has the potential to be disturbed on foraging and roosting grounds whilst hand-harvesting seaweed during the nonbreeding season'. This species is not particularly nervous compared to other wader species, allowing a closer approach than other species (Woodward et al., 2015). For example, one study found a FID of 31.5m for turnstone compared to 80m for redshank and 132m for grey plover (Collop et al., 2016). Within Northumberland, Quigley (1999) observed no effect of periwinkle harvesting on the three most common bird species on rocky shores (Dunlins, Turnstones, and Grey Plover), with generally higher abundances at the collected sites.

A recent study by Whittingham et al. (2019) on turnstone disturbance in the Northumbria Coast SPA found that turnstone densities were higher on sites at, or closer to, offshore refuges compared to mainland sites, while there were declines over time in turnstone counts in sites within

the SPA which were exposed to greater human disturbance. Turnstone density (birds per hectare of suitable habitat) was higher the closer each site was to the nearest offshore refuge, and counts were stable at the two refuge sites. However, no relationship was found between the mainland counts and measures of human population density. Though this study focused on recreational use of the coast, not bait digging, it does highlight the vulnerability of turnstone populations within the Northumbria Coast SPA to human disturbance.

Space for Shorebirds monitor bird disturbance events in Northumberland (Seaton Sluice to Berwick), recording species disturbed and activities causing disturbance. In 2020-21 they recorded 590 potential disturbance events (PDEs) of which almost half (47%) were caused by dog walkers while 39% were just walkers. 3% were caused by rockpooling or exploring the intertidal, while only a single disturbance event was caused by bait digging or gathering, and this was recorded on rock so was not bait digging. This highlights the relative importance of recreational activities in causing bird disturbance, compared to bait digging.

The species impacted were also recorded. Of a total 1331 turnstones disturbed, 42% were by dog walkers, 24% by walkers, 1% by rockpoolers and none by bait collectors. Of 353 purple sandpipers disturbed, 47% were by dog walkers, 32% by walkers and none by bait collectors.

Purple sandpiper shows a preference for rocky shores exposed to the sea, roosting at high tide along the shore and often utilising artificial structures such as concrete sea defences and breakwaters (BirdLife International, 2020). Turnstones frequent productive rocky and shingle shores, breakwaters, sandy beaches with storm-wracked seaweed, short-grass saltmarshes, sheltered inlets, estuaries, exposed reefs and mudflats with beds of molluscs (Hayman *et al.* 1986, del Hoyo *et al.* 1996), roosting together at high tide on undisturbed rocks, sandy spits or offshore islets (BirdLife International, 2020).

Bait digging occurs over the 2-3 hours at low water, particularly on the big spring tides (Tinlin-Mackenzie, 2018). At low tide both bird species feed lower on the shore, predominantly on rocky shores where bait digging activity is not present. However, turnstones do frequent mud and sand flats: there is some risk of disturbance to turnstone when foraging at low tide, though NIFCA assess this to be relatively low due to the low numbers of individuals bait digging, large areas of shore and wide range of habitats turnstones utilise. Birds congregating at

high tide to roost on rocky (both species) or sandy and muddy shores (turnstones) when they are more vulnerable to human disturbance will not be impacted by bait digging as collection does not occur at high tide. While bait digging occurs more frequently in the winter, intense activity only occurs on the biggest spring tides.

Bait digging is at generally low levels within the Northumbria Coast SPA due to the site consisting mainly of rocky shores habitats unsuitable for the activity. Bait digging does occur in some small areas of sand/muddy sand within or near the SPA, particularly at Boulmer and Hauxley. Prey species of turnstone or purple sandpiper are not impacted by bait digging while purple sandpiper are restricted to feeding on the rocky shore so do not overlap spatially with bait digging activities. The wide variety in turnstone diet makes them resilient to reductions in any individual prey item. High tide roosting of both species does not overlap with digging activity for either species since bait digging occurs at low tide. However, turnstones are known to forage on sand and mudflats among other habitats at low tide so could be disturbed by bait digging.

NIFCA conclude with moderate confidence that this activity will not adversely impact conservation objectives for purple sandpiper, and with low-moderate confidence that it will not adversely impact turnstones within the Northumbria Coast SPA.

6. Condition and Conservation Objective Inferences

No information on the condition of the Northumbria Coast SPA features are available on Natural England's Designated Site System.

For turnstone, conservation advice is to 'Restore' the size of the non-breeding population to a level which is above 1,739, which was the population of turnstone at classification in 2000 ([Natural England \(NE\), 2015](#)). The SPA population has since decreased to 681 (5-year peak mean 2011-2016). Nationally, turnstone populations are experiencing long-term declines. The turnstone decline within the SPA may be likely to reflect broadscale populations trends rather than any site-specific issues (Frost et al., 2020). However, the declines in counts of Turnstone from sites within the Northumbrian coast could be driven by a range of factors, such as recreational disturbance, changes in food abundance/availability (Burton et al. 2005, Burton & Goddard 2006) or climate change which has altered temperatures during the winter over recent decades across the east Atlantic flyway (Austin & Rehfish 2005, Mieszowska et al. 2006, Pearce-Higgins & Holt 2013). A recent study by Whittingham et al. (2019) on turnstone disturbance in the Northumbria Coast SPA found that turnstone densities were higher on sites at, or closer to, offshore refuges compared to mainland sites, while there were declines in turnstone counts in sites within the SPA which were exposed to greater human disturbance. This suggests disturbance events through human activity could be related to changes in turnstone behaviour with potential negative impacts. Though bait digging is unlikely to be causing this decline, the in-combination assessment will explore the cumulative impact of other human activities including recreation.

For purple sandpiper, conservation advice is to 'Restore' the size of the non-breeding population to a level which is above 787, which was the size of the population at classification in 2000 ([Natural England \(NE\), 2015](#)). The SPA population has since decreased to 242 (5-year peak mean 2011-2016). While there may be a number of factors influencing purple sandpiper decline such as recreational disturbance, UK declines and distribution changes of wintering Purple Sandpiper are consistent with shifts towards breeding grounds in northern Scandinavia (Frost et al., 2020). The purple sandpiper decline within the SPA is likely to reflect broadscale populations trends rather than any site-specific issues (Frost et al., 2020).

<p>7. Is the potential scale or magnitude of any effect likely to be significant?</p>	<p>Alone: No</p>	<p>OR In-combination No (Annex 5) Human disturbance from other activities including recreational (which overlaps spatially with bait digging) may have an impact on estuarine birds, particularly turnstone. These impacts are likely much higher than disturbance from bait digging.</p>
<p>8. Have NE been consulted on this LSE test? If yes, what was NE's advice?</p>	<p>Yes Synthesis of evidence and local knowledge informing this decision occurred between August 2018 and the date of this document's creation with stakeholders (where appropriate) and other statutory authorities. Natural England (CS) was involved with this informal process.</p>	

Conclusion

Is the proposal likely to have a significant effect 'alone or in combination' on the Northumbria Coast SPA?

NIFCA conclude with moderate confidence that this activity alone will not adversely impact conservation objectives for purple sandpiper, and with lower confidence that it will not adversely impact turnstones within the Northumbria Coast SPA. There is a higher risk of adverse impacts in combination with hand gathering although the activities are spatially separated therefore NIFCA conclude adverse impacts are unlikely, but with low confidence. An Appropriate Assessment for hand gathering in the NC SPA is being conducted in areas of high collection pressure, in addition to an Appropriate Assessment for bait digging within the BNNC SAC which includes the two bait digging areas in the NC SPA (Boulmer and Newton) and consider bird disturbance. The Coquet to St Mary's MCZ assessment includes Hauxley and also considers bird disturbance.

Bait digging and hand gathering has a Monitoring and Control Plan, any increases in activity or impacts to features will be monitored through this plan. Any management of activities causing bird disturbance should be considered under a multi-organisation approach which manages all activities causing disturbance including recreational activities such as dog walking.

Test for Likely Significant Effect (LSE)

NCSPA – 274: Intertidal Sand and Muddy Sand (Supporting Habitat)

<p>1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?</p>	<p>No</p>
<p>2. What pressures (such as abrasion, disturbance) are potentially exerted by the gear type(s)?</p> <p>Pressures listed are all those for which the feature is deemed to be sensitive. Pressures in bold are Medium-High Risk. The sensitivities listed are based on the 2020 Conservation Advice for the Northumbria Coast SPA available on Natural England's Designated Site System.</p>	<p>Abrasion/disturbance of the substrate on the surface of the seabed</p> <p>Habitat structure changes - removal of substratum (extraction)</p> <p>Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion</p> <p>Removal of non-target species</p> <p>Removal of target species</p> <p>Deoxygenation</p> <p>Introduction of light</p> <p>Introduction or spread of invasive non-indigenous species (INIS)</p>
<p>3. Is the feature potentially exposed to the pressure(s)?</p>	<p>Yes</p>

4. What are the conservation objectives for the feature?

Conservation objectives are not available for this feature (supporting habitat only) therefore were taken from BNNC SAC Bait digging assessment tLSE-021.

Conservation objectives which may be impacted by bait digging are underlined.

The Conservation Objectives for intertidal sand and muddy sand are to –
 Maintain OR Recover OR Restore the abundance of listed species*, to enable each of them to be a viable component of the habitat.

Maintain:

- The presence and spatial distribution of intertidal sand and muddy sand communities.
- The total extent of intertidal sand and muddy sand at 2480 ha at 103 ha, and spatial distribution.
- The distribution of sediment composition types across the feature.
- Total organic carbon (TOC) content in the sediment at existing levels.
- The species composition of component communities. [ASSESSED AS PREY AVAILABILITY UNDER ESTUARINE BIRD FEATURE]
- The presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity.
- The natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes and stability, across the habitat.
- The natural physico-chemical properties of the water.
- Sediment transport pathways to and from the feature to ensure the replenishment of habitats that rely on the sediment supply.
- The dissolved oxygen (DO) concentration at levels equating to High Ecological Status (specifically $\geq 5.7 \text{ mg L}^{-1}$ (at 35 salinity) for 95 % of year), avoiding deterioration from existing levels.
- Natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.

Restore:

- Water quality to mean winter dissolved inorganic nitrogen levels at which biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features.

Restrict/reduce:

- The introduction and spread of non-native species and pathogens, and their impacts.
- Surface sediment contaminants (<1cm from the surface) to below the OSPAR Environment Assessment Criteria (EAC) or Effects Range Low (ERL)

	<p>Aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.</p>
--	---

5. What are the potential effects/impacts of the pressure(s) on the feature, taking into account the exposure level?

Discrete areas of estuarine intertidal mudflats and sand flats are included within the Northumbria Coast SPA, including Boulmer, Hauxley and Newton where bait digging occurs (Annex 3).

The turning over of sediment by bait diggers and erosion of sediment mounds by tides and wave action leads to a loss of finer fractions and associated organic material. In contrast, the depressions from holes dug may accumulate fine sediments and organic matter resulting in an organically rich anoxic layer at the bottom of the depression (Fowler, 1999, Watson et al., 2017; Anderson and Meyer, 1986). This could have implications for local sediment load and turbidity levels (Watson et al., 2017). Long-term changes in turbidity can have a range of biological effects such as affecting fish health or clogging the filtering organs of suspension feeding animals, which can in turn adversely affect bird species.

Intensive bait digging can result in exposure of anoxic sediment layers, leading to reduced oxygen availability in surface sediments. High turbidity can also lead to a drop in dissolved oxygen, especially in warmer months, which can impact on fish and invertebrate communities (Best et al., 2007) with knock-on impacts on birds.

Recovery rates of the sediment from bait digging are highly variable, depending on site characteristics such as habitat type, energy of the site (higher energy, more coarse sediments recover more quickly) as well as behaviour of bait diggers themselves (backfilling of holes significantly reduces impacts to the sediment but is rarely observed). Tinlin-Mackenzie (2018) characterised sediments within the BNNC according to their sensitivity to bait digging based on habitat and sediment type (with muddy areas being more sensitive), and importance to birds (based on being within an SPA). Vulnerability was also measured, combining sensitivity with suitability i.e. how suitable habitats were for bait digging.

Sediments within the Northumbria Coast SPA that overlapped with this model (mainly at Boulmer, Hauxley and Newton) were generally classified as Very Low-Low sensitivity to bait digging, due to being less muddy than other areas (Lindisfarne and Budle Bay). However, though the impacts from each collection event at these locations is smaller than more sensitive areas, they are dug more often leading to high vulnerability to bait digging overall.

There is local evidence of bait digging impacts on sediments. Howell (1985) found large increases in heavy

	<p>metals lead and cadmium in the surface layers of Budle Bay caused by intensive bait digging (>50 people) and the exposure of anoxic sediments causing these to become bioavailable. Tinlin-Mackenzie (2018) simulated digging disturbance at Fenham Flats (LNNR) and found sediment characteristics were noticeably altered during treatments until the next treatment three weeks later, with anoxic sediments brought to the surface and changes to sediment penetrability and softness. The more sheltered intertidal mud flats at Budle Bay and Fenham Flats might be expected to have slower recovery rates than sites within the NC SPA which are less sensitive (Tinlin-Mackenzie, 2018). For example, Blake (1979) reported holes at Whitley Bay (outside but in the vicinity of the SPA) were re-filled by mud and fine sand within about 2 days of digging which suggests that sediment may be more resilient at this location and potentially other areas with coarser, more sandy sediment than within the LNNR.</p> <p>Any negative impacts on the sediments are unlikely to have a direct impact on birds however could impact indirectly through prey availability. Purple sandpiper do not frequent sand and muddy sand habitats, remaining on the rocky shore. As discussed above, turnstone do not target infaunal invertebrates which are most at-risk from sediment impacts. They also have a wide variety in their diet so are unlikely to suffer a reduction in prey availability due to sediment impacts from bait digging within the NC SPA.</p> <p>NIFCA conclude, with high confidence, that bait digging impacts on supporting habitat (sand and muddy sand) will not adversely impact purple sandpiper, and conclude with moderate confidence that impacts on supporting habitat will not adversely impact turnstone within the NC SPA.</p>
<p>6. Condition and Conservation Objective Inferences</p>	<p>There are no conservation objectives for intertidal sand and muddy sand for Northumbria Coast SPA on Natural England's designated Site System.</p>

<p>7. Is the potential scale or magnitude of any effect likely to be significant?</p>	<p>Alone:</p> <p>No. The impact of bait digging on the sediments is not likely to have significant adverse impacts on estuarine bird features.</p>	<p>OR In-combination</p> <p>No. Recreation and hand gathering activities do not impact the sand and muddy sand in the same way that bait digging does so will not add to sediment impacts.</p>
<p>8. Have NE been consulted on this LSE test? If yes, what was NE's advice?</p>	<p>Yes</p> <p>Synthesis of evidence and local knowledge informing this decision occurred between August 2018 and the date of this document's creation with stakeholders (where appropriate) and other statutory authorities. Natural England (CS) was involved with this informal process.</p>	

Conclusion

Is the proposal likely to have a significant effect 'alone or in combination' on the Northumbria Coast SPA?

NIFCA conclude, with high confidence, that bait digging impacts on supporting habitat (sand and muddy sand) will not adversely impact purple sandpiper, because this species does not use this habitat. NIFCA conclude with moderate confidence that bait digging on sand and muddy sand will not adversely impact turnstones within the NC SPA, as overall prey availability is unlikely to be affected due to the turnstone's diverse diet.

References

- Anderson FE and Meyer LM (1986). The interaction of tidal currents on a disturbed intertidal bottom with a resulting change in particulate matter quantity, texture and food quality, estuarine, Coastal and Shelf Science, 22: 19-29
- Austin GE & Rehfish MM (2005) Shifting distributions of migratory fauna in relation to climatic change. Global Change Biology, 11: 31-38
- Best, M.A., Wither, A.W. and Coates, S., 2007. Dissolved oxygen as a physico-chemical supporting element in the Water Framework Directive. *Marine pollution bulletin*, 55(1-6), pp.53-64.
- BirdLife International (2020) Species factsheet: *Calidris maritima*. Downloaded from <http://www.birdlife.org> on 30/11/2020
- BirdLife International (2020) Species factsheet: *Arenaria interpres*. Downloaded from <http://www.birdlife.org> on 30/11/2020
- Bolam, G. 1912. Birds of Northumberland and the Eastern Borders. Henry Hunter Blair, Alnwick.
- Bowgen, K.M., Stillman, R.A. and Herbert, R.J.H. (2015) 'Predicting the effect of invertebrate regime shifts on wading birds: Insights from Poole Harbour, UK', *Biological Conservation*, 186, pp. 60-68.
- Brown, A. & Grice, P. 2005. Birds in England. T & AD Poyser, London.
- Burton, N.H., Evans, P.R. and Robinson, M.A., 1996. Effects on shorebird numbers of disturbance, the loss of a roost site and its replacement by an artificial island at Hartlepool, Cleveland. *Biological Conservation*, 77(2-3), pp.193-201.
- Burton, N.H., Fuller, R.A. and Eaton, M.A., 2005. Between-year changes in the wintering sites of Ruddy Turnstones *Arenaria interpres*: a response to diminished food resources?. *BULLETIN-WADER STUDY GROUP*, 107, p.36.
- Burton, N.H.K. and Goddard, A.P., 2007. Impacts of changes in sewage disposal on waterbirds wintering on the Northumbrian coast-final report. *BTO Research Report*, (442).
- Collop, C., Stillman, R.A., Garbutt, A., Yates, M.G., Rispin, E. & Yates, T. 2016. Variability in the area, energy and time costs of wintering waders responding to disturbance. *Ibis*, 158, 711-725.
- Davidson, N. and Rothwell, P. (1993) *Disturbance to waterfowl on estuaries*. [Tring]: Wader Study Group
- del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. *Handbook of the Birds of the World, vol. 3: Hoatzin to Auks*. Lynx Edicions, Barcelona, Spain.
- Dierschke, V., 1993. Food and feeding ecology of purple sandpipers *Calidris maritima* on rocky intertidal habitats (Helgoland, German Bight). *Netherlands Journal of Sea Research*, 31(4), pp.309-317.
- Feare, C.J., 1966. The winter feeding of the Purple Sandpiper. *British birds*, 59, pp.165-179.
- Fowler, S.L. (1999) *Natura 2000: Guidelines for managing the collection of bait and other shoreline animals within UK European marine sites*. English Nature UK Marine SACs Project
- Frost, T.M., Calbrade, N.A., Birtles, G.A., Mellan, H.J., Hall, C., Robinson, A.E., Wotton, S.R., Balmer, D.E. and Austin, G.E. 2020. *Waterbirds in the UK 2018/19: The Wetland Bird Survey*. BTO/RSPB/JNCC. Thetford.
- Goodship, N. & Furness, R.W. 2019. Seaweed hand-harvesting: literature review of disturbance distances and vulnerabilities of marine and coastal birds. *Scottish Natural Heritage Research Report No. 1096*.
- Hayhow DB, Ausden MA, Bradbury RB, Burnell D, Copeland AI, Crick HQP, Eaton MA, Frost T, Grice PV, Hall C, Harris SJ, Morecroft MD, Noble DG, Pearce-Higgins JW, Watts O, Williams JM, The state of the UK's birds 2017. The RSPB, BTO, WWT, DAERA, JNCC, NE and NRW, Sandy, Bedfordshire.
- Hockin, D., Ounsted, M., Gorman, M., Hill, D., Keller, V., & Barker, M. A. (1992) Examination of the effects of disturbance on birds with reference to its importance in ecological assessments. *Journal of Environmental Management*. 36: 253-286

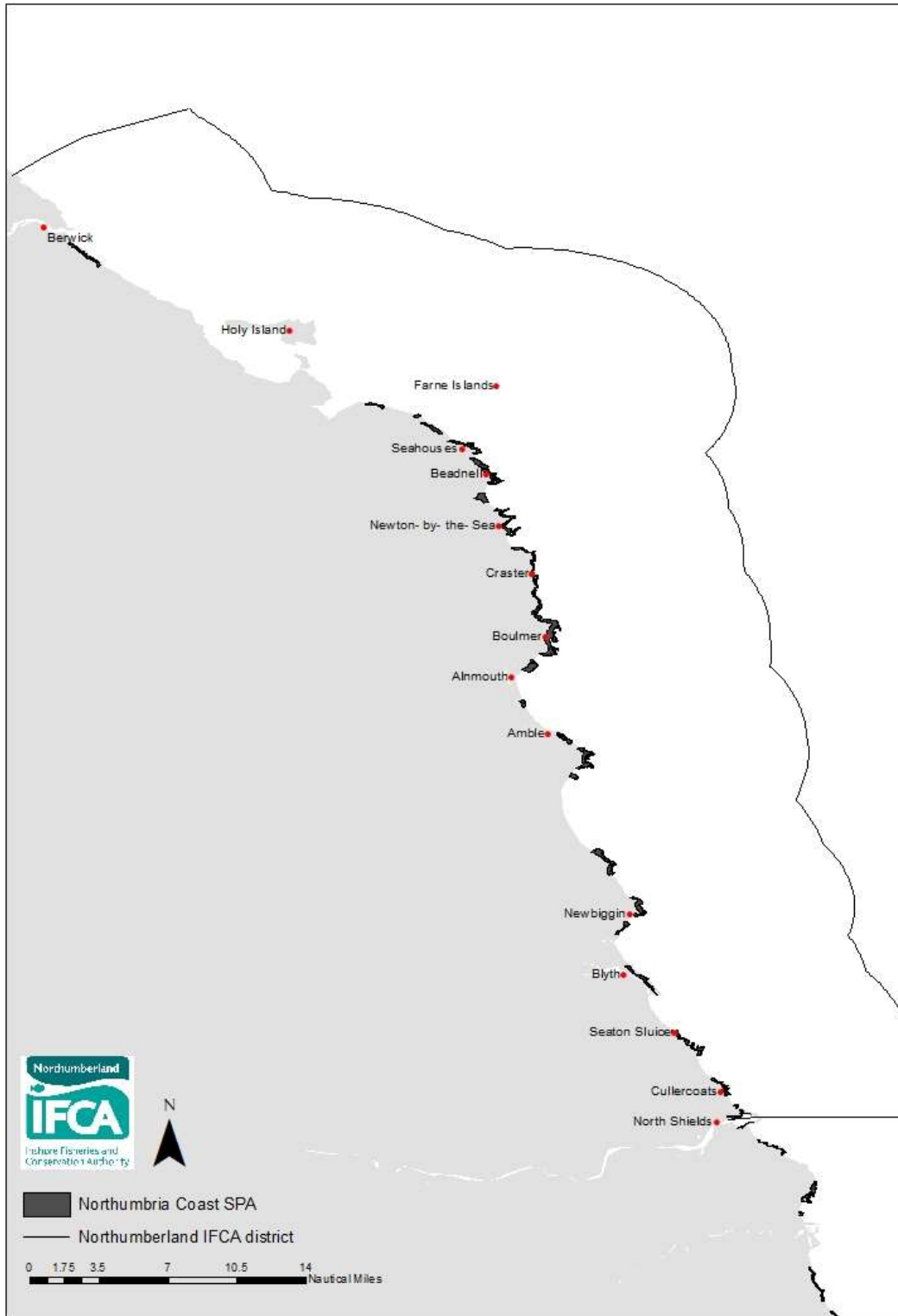
- Masero, J.A., Castro, M., Estrella, S.M. and Perez-Hurtado, A. (2008) 'Evaluating impacts of shellfish and baitworm digging on bird populations: short-term negative effects on the availability of the mudsnail *Hydrobia ulvae* to shorebirds', *Biodiversity and Conservation*, 17(4), pp. 691-701
- Mieszkowska, N., Kendall, M.A., Hawkins, S.J., Leaper, R., Williamson, P., Hardman-Mountford, N.J. and Southward, A.J., 2006. Changes in the range of some common rocky shore species in Britain—a response to climate change? In *Marine Biodiversity* (pp. 241-251). Springer, Dordrecht.
- Mieszkowska, N., Sugden H. 2014 'Berwickshire Intertidal Rocky Reefs. Final Report'. The Marine Biological Association Report from Natural England.
- Mittelhauser, G.H., Tudor, L. and Connery, B., 2012. Within-year movements and site fidelity of Purple Sandpipers during the nonbreeding season. *Journal of Field Ornithology*, 83(1), pp.32-40.
- Navedo, J.G. and Herrera, A.G., 2012. Effects of recreational disturbance on tidal wetlands: supporting the importance of undisturbed roosting sites for waterbird conservation. *Journal of Coastal Conservation*, 16(3), pp.373-381.
- Pearce-Higgins, J.W. and Holt, C.A., 2013. Impacts of climate change on waterbirds. *Marine Climate Change Impacts Partnership Science Review*, 2013, pp.149-154.
- Prater, A.J. 1981. Estuary Birds of Britain and Ireland. T & AD Poyser, Calton.
- Rehfishch, M.M., Clark, N.A., Langston, R.H. and Greenwood, J.J., 1996. A guide to the provision of refuges for waders: an analysis of 30 years of ringing data from the Wash, England. *Journal of Applied Ecology*, pp.673-687.
- Rogers, D.I., Piersma, T. & Hassle, C.J. 2006. Roost availability may constrain shorebird distribution: exploring the energetic costs of roosting and disturbance around a tropical bay. *Biol. Cons.* 133: 225–235.
- Smit, C.J. & Visser, G.J.M. 1993. Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area. *Wader Study Group Bull.* 68: 6–19.
- Space for Shorebirds. Accessed 30/11/20: <http://spaceforshorebirds.co.uk/dog-rangers/>
- Summers, R.W., Smith, S., Nicoll, M. and Atkinson, N.K., 1990. Tidal and sexual differences in the diet of Purple Sandpipers *Calidris maritima* in Scotland. *Bird Study*, 37(3), pp.187-194.
- Summers, R.W., Foster, S., Swann, B. & Etheridge, B. 2012. Local and global influences on population declines of coastal waders: Purple Sandpiper *Calidris maritima* numbers in the Moray Firth, Scotland. *Estuarine, Coastal and Shelf Science* 102-103, 126-132
- Summers, R., 2014. The population dynamics of wintering Purple Sandpipers in Britain. In *Ecology and conservation of birds in upland and alpine habitats, BOU Proceedings, BOU Annual Meeting*.
- Tinlin-Mackenzie, A.R., 2018. *Intertidal collection within the Berwickshire and North Northumberland Coast European Marine Site: investigating the scale, locale, and ecological impacts of harvesting *Arenicola marina*, *Arenicola defodiens*, and *Littorina littorea** (Doctoral dissertation, Newcastle University).
- Townshend, D.J. and O'Connor, D.A. (1993) 'Some effects of disturbance to waterfowl from bait digging and wildfowling at Lindisfarne National Nature Reserve, north-east England.', In: *Davidson, N. and Rothwell, P. Disturbance to waterfowl on estuaries. Wader Study Group Bulletin*, 68, pp. 47-52
- Urfi A.J., Goss-Custard J., Lev S. & Durell D. (1996) The ability of oystercatchers *Haematopus ostralegus* to compensate for lost feeding time: field studies on individually marked birds. *Journal of Applied Ecology* 33(4) 873-883.
- Van den Heiligenberg, T. (1987) 'Effects of mechanical and manual harvesting of lugworms *Arenicola marina* L. on the benthic fauna of tidal flats in the Dutch Wadden sea', *Biological Conservation*, 39(3), pp. 165-177
- Watson, G.J., Murray, J.M., Schaefer, M., Bonner, A. and Gillingham, M. (2017) 'Assessing the impacts of bait collection on inter-tidal sediment and the associated macrofaunal and bird communities: the importance of appropriate spatial scales', *Marine Environmental Research*.
- West, A.D., Goss-Custard, J.D., Stillman, R.A., Caldow, R.W.G., dit Durell, S.E.A.I.V. and McGrorty, S. (2002) 'Predicting the impacts of disturbance on shorebird mortality using a behaviour-based model', *Biological Conservation*, 106(3), pp. 319-328

NCSPA-tLSE 037

Whittingham, M.J., McKenzie, A.J., Francksen, R.M., Feige, D., Cadwallender, T., Grainger, M., Fazaa, N., Rhymer, C., Wilkinson, C., Lloyd, P. and Smurthwaite, B., 2019. Offshore refuges support higher densities and show slower population declines of wintering Ruddy Turnstones *Arenaria interpres*. *Bird Study*, 66(4), pp.431-440.

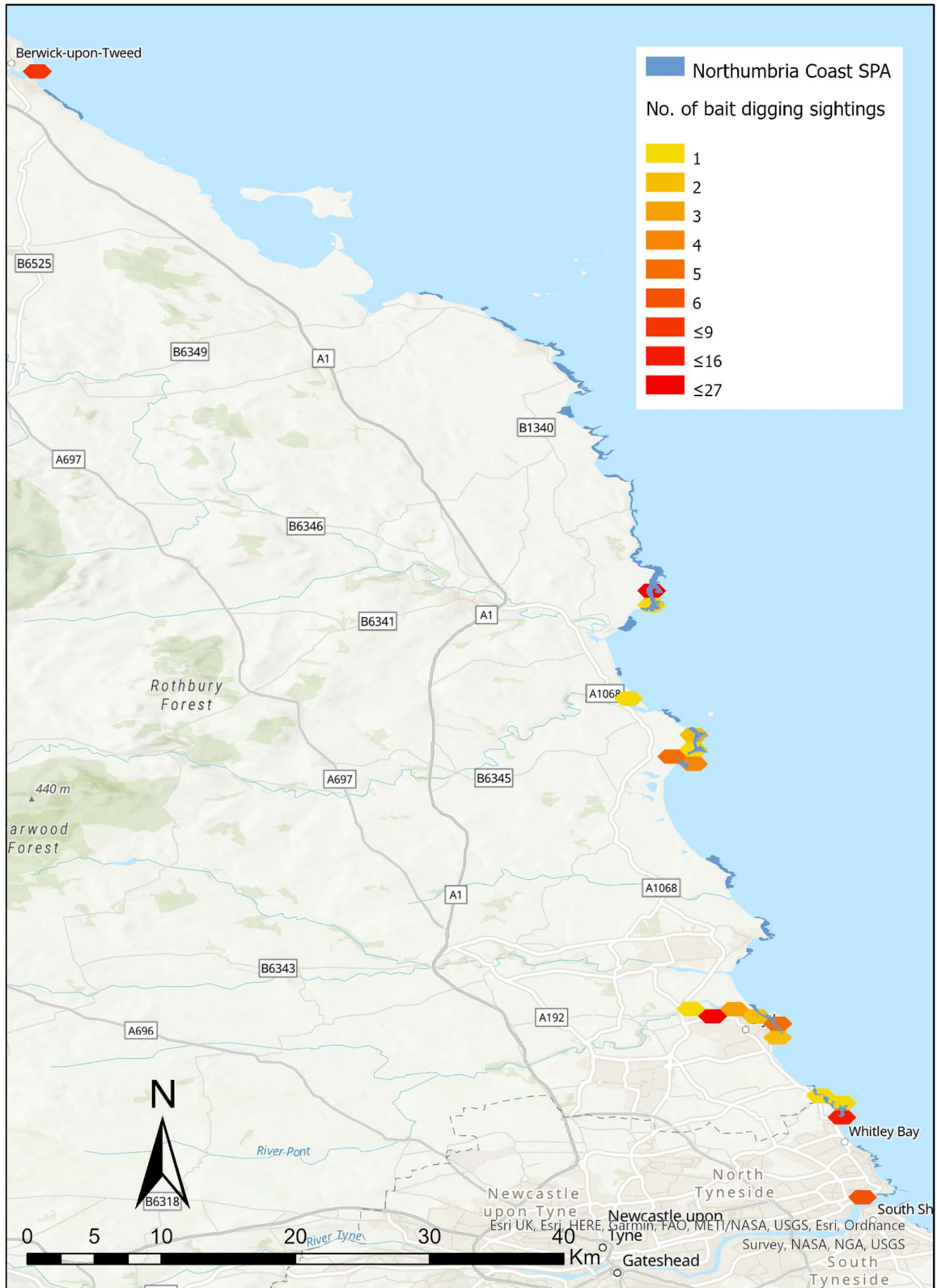
Woodward, I.D., Ross-Smith, V.H., Pérez-Domínguez, R., Rehfish, M.M. and Austin, G.E., 2015. *The Wash Bird Decline Investigation 2014*. British Trust for ornithology.

Annex 1
Northumbria Coast SPA map



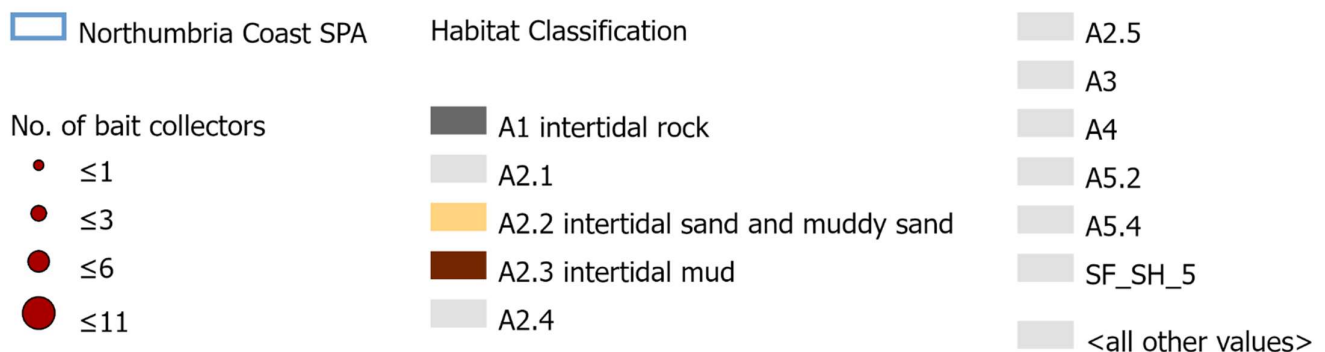
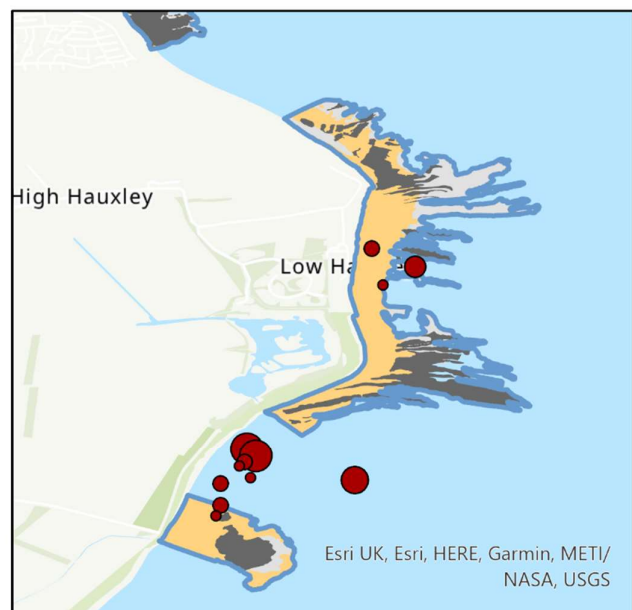
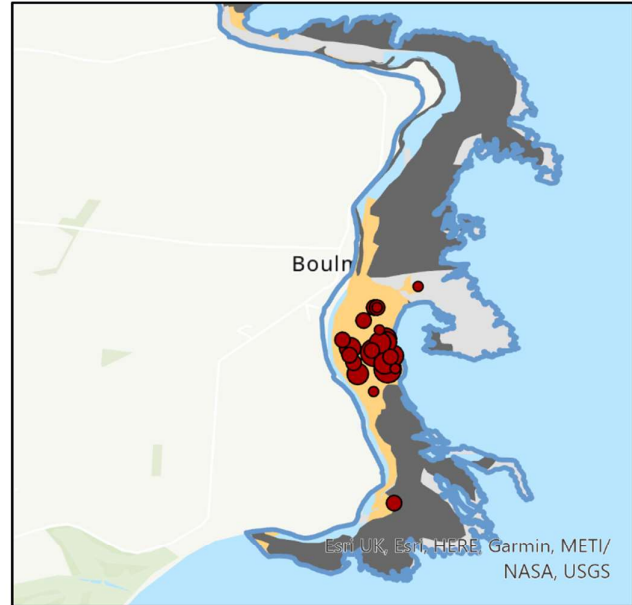
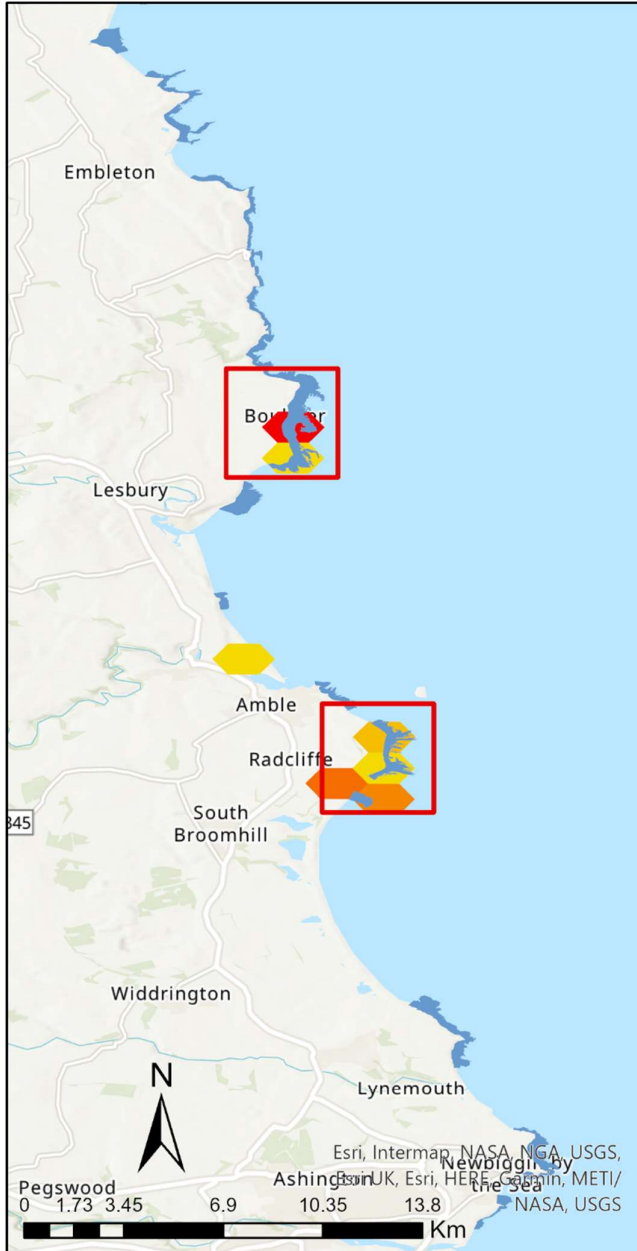
Annex 2

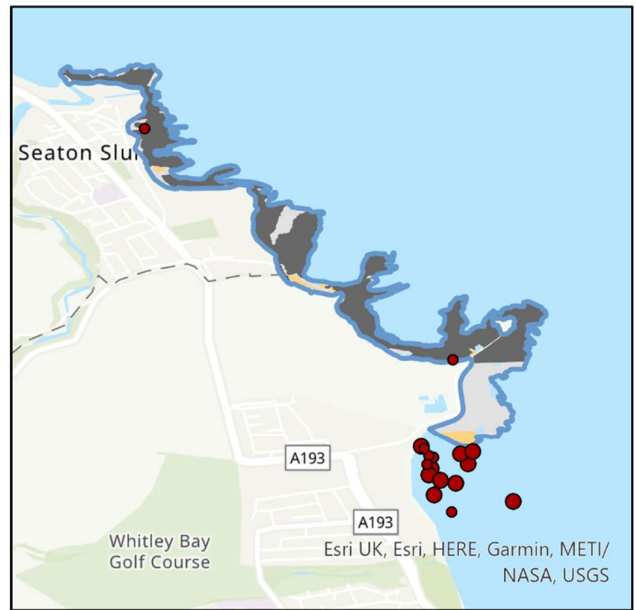
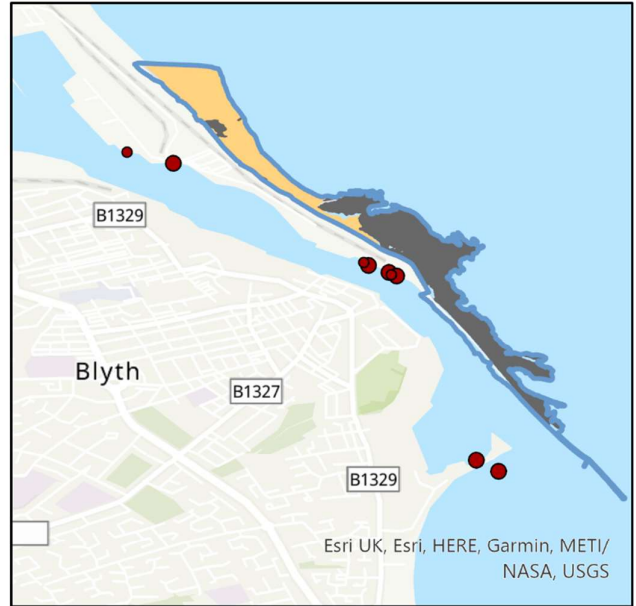
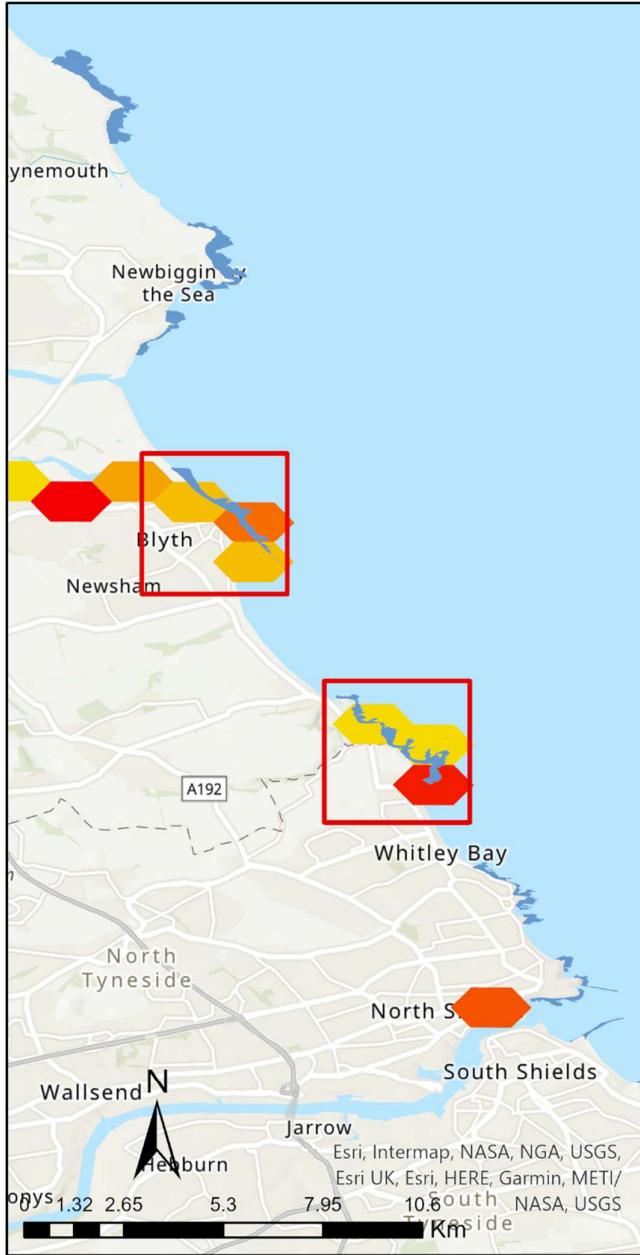
Overlap between Northumbria Coast SPA and number of bait digging sightings on NIFCA patrols from 2016-20. This map highlights the general lack of bait digging activity within the Northumbria Coast SPA and bait digging activity for most of the SPA, and identifies potential areas of overlap.



Annex 3

Maps showing hotspots at Boulmer, Hauxley, Blyth and Seaton Sluice/Whitley Bay area, identified in Annex 2 as potential overlap between Northumbria Coast SPA and bait digging. Relevant Eunis habitat classifications (A1 intertidal rock; A2.2 intertidal sand and muddy sand; and A2.3 intertidal mud) within SPA boundaries are shown, in addition to location of bait digging sightings (number of bait collectors per sighting).





Northumbria Coast SPA

Habitat Classification

No. of bait collectors

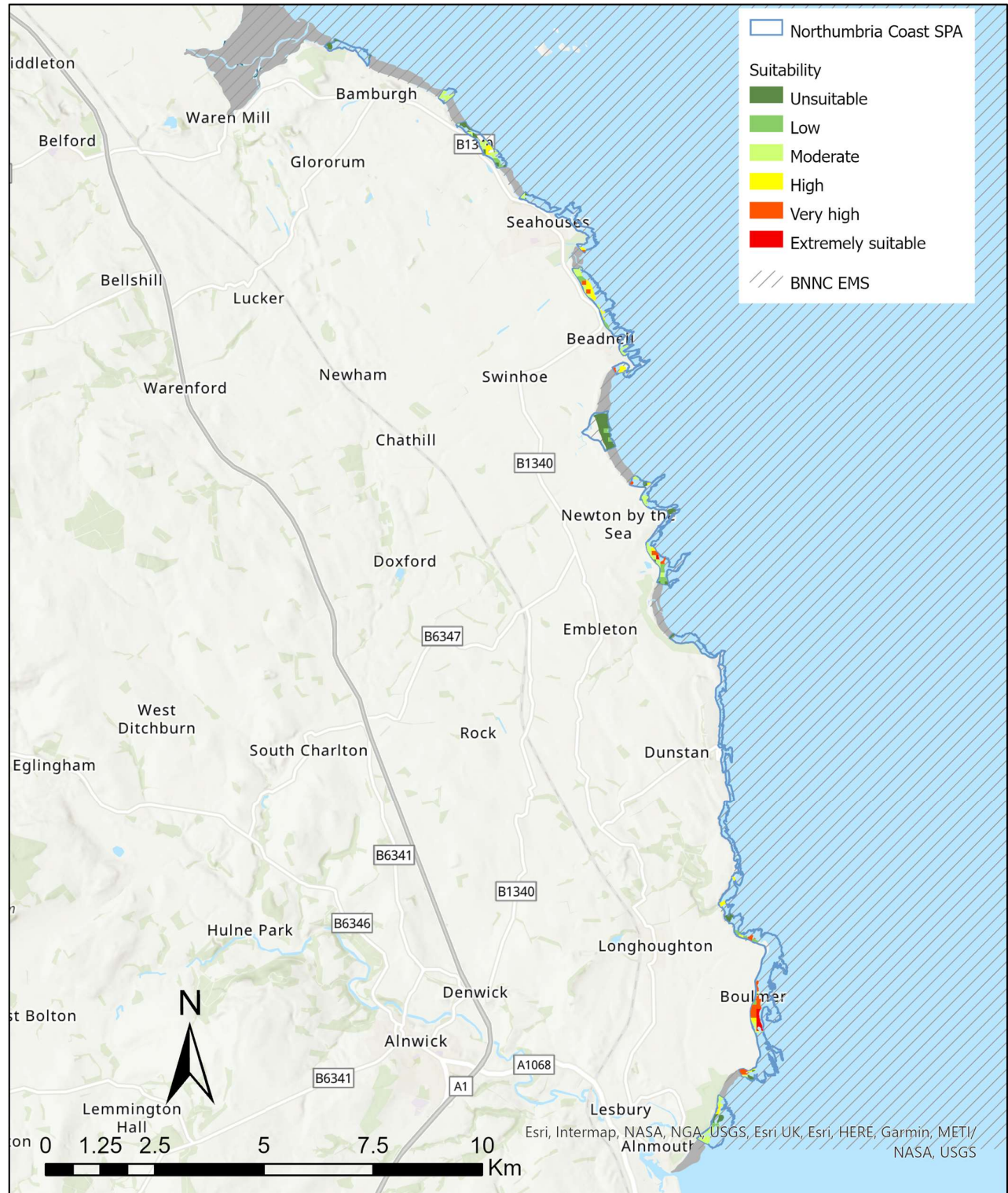
- ≤1
- ≤3

- A1 intertidal rock
- A2.1
- A2.2 intertidal sand and muddy sand
- A2.3 intertidal mud
- A2.4

- A2.5
- A3
- A4
- A5.2
- A5.4
- SF_SH_5
- <all other values>

Annex 4

Suitability map of bait digging showing modelled areas suitable for lugworm harvesting, acting as a predictor of lugworm collection activity within the Berwickshire and North Northumberland Coast (BNNC) SAC (Tinlin-Mackenzie, 2018). Coloured areas correspond to modelled areas within the Northumbria Coast SPA while grey areas fall outside of SPA boundaries. Not all areas within the Northumbria Coast SPA are modelled however this map highlights additional potential areas where bait digging occurs which are not recorded by NIFCA patrol sightings, namely between Seahouses and Beadnell and at Newton-by-the-Sea.



Annex 5 In-combination Assessment

In-combination assessments of Digging with forks with other plans and projects within and around Northumbria Coast SPA.

Plans and Projects			
Activity	Description	Assessment	Potential Pressure
Fishing	<p>Potting</p> <p>In 2016 NIFCA introduced a recreational potting permit, with permit holders allowed to fish up to five pots within the district and only allowed to take 2 lobster (5 brown or velvet crabs, 20 whelks or 5 prawns) per day. In 2019 there were 204 recreational permit holders.</p>	<p>Recreational pots are mainly within the infralittoral zone with little overlap with the intertidal where purple sandpiper and turnstone occur. This activity is often seasonal and infrequent and does not overlap spatially with bait digging activities or important habitat for estuarine birds, so is unlikely to have an in-combination impact on SPA features.</p>	<p>Recreational potting occurs on rocky infralittoral areas throughout the SPA. This activity is small scale in comparison to commercial potting activity. In 2019, NIFCA had 204 registered recreational potting permit holders, as each permit holder is only allowed a maximum of 5 pots this results in a total of 1,020 pots.</p> <p>Cleeking is likely to occur in a similar location to recreational potting, however activity is very low level.</p> <p>The vast majority of commercial potting will not be co-located with the activities assessed here.</p>
Fishing	<p>Hand Gathering</p> <p>Hand gathering targeting shore crabs, periwinkles and lobster from rocky shore habitats. Activities occur year-round with the main peak in the summer as well as before Christmas, and commercial scale collection occurring within the district.</p>	<p>Peak hand gathering and periwinkle collection and peak bait digging season do not overlap, though these activities do co-occur.</p> <p>The limited number of people engaged in hand gathering on the rocky shore, especially during the winter, mean that a significant adverse effect on estuarine birds is unlikely. Both activities occur at low tide when birds are less likely to be disturbed and have space to avoid people, so disturbance is unlikely to have a significant adverse impact even in combination.</p>	<p>Gathering is highest at spring tides and therefore at the same time as bait digging activities. Though spatially separated, this could increase disturbance pressure as a larger area of coast across different habitats is facing human pressure however these activities have different seasonal peaks with higher activity levels in the winter for bait digging and in summer for periwinkle collection. So activities are unlikely to be occurring at high levels at the same time. Further there are small numbers of people intertidal gathering at any one time.</p>
Coastal Infrastructure	<p>Outflow pipes Maintenance</p>	<p>Appropriate licence conditions/monitoring has been incorporated to mitigate any impacts.</p>	<p>Small scale – low number of outfall pipes on reefs along the Northumberland Coast. Any intertidal impacts will be connected with maintenance and carried out infrequently.</p>
Coastal management scheme - Northumberland and North Tyneside Shoreline Management Plan 2 (05/2009) covers the coastline from the	<p>Flood and erosion risk management</p>	<p>As stated in Section (2) of the document projects and plans within the SMP are subjected to its own Appropriate Assessment for proposed work, which assesses any</p>	<p>Any coastal management works along the coast under the aegis of a Coastal Management Scheme.</p>

Scottish border to the River Tyne.		impacts to Northumbria Coast SPA.	
Cable laying/infrastructure	Subsea cables with intertidal element	Appropriate licence conditions/monitoring has been incorporated to mitigate any impacts. Plans or projects must obtain a marine licence which must assess impacts to reef features within Northumbria Coast SPA.	Any subsea cables, with an intertidal element, along the coast relating to the relevant plan or projects under Marine and Coastal Access Act.
Other activities being considered (which are not plans or projects by definition)			
Activity	Description	Assessment	Potential Pressure
Intertidal Recreational Activity	<p>Recreational activities such as dog walking and rockpooling frequently occur in the SPA and could disturb foraging or roosting birds, particularly at high tide when there is a narrow stretch of habitat for birds to roost and people to walk. Recreational activities e.g. rockpooling occur most in summer however some recreational activities such as dog walking occur year-round and therefore overlap with overwintering birds. Over 50% of coastal bird disturbance involves a dog (Space for Shorebirds).</p>	<p>Bait digging activities mainly occur on spring tides and at low tide when birds have a greater area to avoid people and are therefore less likely to be disturbed. Recreational use of the rocky shore is significantly lower in winter therefore bird disturbance in this important habitat is likely to be low at low tide in the winter, when bait digging activities occur. Other recreational activities on sandy shores do coincide with bait digging however birds still have rocky shore habitat available which they prefer.</p> <p>Space for Shorebirds monitor bird disturbance events in Northumberland (Seaton Sluice to Berwick), recording species disturbed and activities causing disturbance. In 2020-21 they recorded 590 potential disturbance events (PDEs) of which almost half (47%) were caused by dog walkers while 39% were just walkers. 3% were caused by rockpooling or exploring the intertidal, while only a single disturbance event was caused by bait digging or gathering, and this was recorded on rock so was not bait digging. This highlights the relative importance of recreational activities in causing bird disturbance, compared to bait digging.</p>	<p>The recent study by Whittingham et al. (2019) shows a decline in Turnstone populations on mainland sites including within the Northumbria Coast SPA compared to offshore refuges therefore cumulative disturbance from recreational activity may have a significant impact.</p>