Habitats Regulations Assessment document: BNNC SAC – tLSE 022

European Marine Site:	**Berwickshire and North Northumberland Coast SAC (BNNC SAC)**
Generic sub-feature(s):	**Intertidal rock, Intertidal biogenic reef - mussels**
Gear type(s):	**Handwork (access from land)**
NIFCA tLSE type:	**Detailed**
Gear/feature interaction reference(s):	**BNNC SAC – 227** **BNNC SAC – 587** **BNNC SAC – 588**

Revision history		
Date	***Revision***	***Editor***
13/08/2018	Document created	AA
07/08/2018	Intertidal bedrock reef and intertidal boulder and cobble reef section drafted	AA
30/06/2020	Information added to document	AA
18/11/2020	Information added to document	AA
13/12/2021	Information added to document and draft finalised	AA
15/02/2024	Read through, updated some information and sub-features from DSS.	KO
20/09/2024	Reviewed	SR
21/11/2024	Updated sightings data, map, mussel/periwinkle survey summary.	SR
02/12/2024	Reviewed with Natural England	PW/SR/CLS/AA
03/12/2024	References added	SR
03/12/2024	Sent to NE for final review	SR
13/02/2025	Agreed and finalised	CLS/PW/SR/AA

Has Natural England been formally consulted on this tLSE (and do they agree)?	**Yes, NE have been consulted throughout the process.**

Date of document completion/'sign-off':	**13/02/2025**

Test for Likely Significant Effect (LSE)

BNNC SAC – 587 Intertidal rock

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	No
2. What pressures (such as abrasion, disturbance) are potentially exerted by the gear type(s)? 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 current Conservation Advice available on Natural England's Designated Site System.	**Abrasion/disturbance of the substrate on the surface of the seabed** **Habitat structure changes - removal of substratum (extraction)** **Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion** **Removal of non-target species** **Removal of target species** Deoxygenation Introduction of light Introduction or spread of invasive non-native species (INNS)
3. Is the feature potentially exposed to the pressure(s)?	Yes
4. What are the conservation objectives for the feature? *A list of key structural and influential species is at this time not available from Natural England. Species which are a viable component of the habitat are likely to include those which are hand gathered such as lobster, shore crab, periwinkle, flora (*Fucus* spp., *Osmundia* spp. etc.).	The conservation objectives for Intertidal rock are to **Maintain:** - The presence and spatial distribution of intertidal rock communities - The total extent and spatial distribution of intertidal rock - The abundance of listed typical species* - The surface and structural complexity of the reef - The species composition of component communities - The natural physical energy resulting from waves, tides and other water flows - The natural physico-chemical properties of the water - The natural rate of sediment deposition - The dissolved oxygen (DO) concentration at levels equating to High Ecological Status - Water quality at mean winter dissolved inorganic nitrogen level - Natural levels of turbidity **Restrict**: - The introduction and spread of non-native species and pathogens **Reduce:** - Reduce aqueous contaminants to levels equating to High Status Those conservation objectives that might be affected by handwork activity are underlined.

5. What are the potential effects/impacts of the pressure(s) on the feature, taking into account the exposure level?	The BNNC SAC boundary from North of the Northumberland IFCA district boundary at Fast Castle Head to just north of Alnmouth (Annex 1). Intertidal hand gathering within the BNNC SAC includes: hand gathering for periwinkle (*Littorina littorea*) and for shore/peeler crab (*Carcinus maenus*), and cleeking for European lobster (*Homarus gammarus*) for example. NIFCA have also received requests to carry out collection of seaweed and are aware of a commercial operator planning to carry out collection of seaweed species on a commercial basis (more information is needed on the area and scale of this activity before assessments can be carried out). As this is a new activity it requires an assessment to be carried out, this falls outside of the original Article 6 assessment process. A separate assessment will be conducted when information on this activity is provided by the applicant. They have been told of the legal requirements and necessity of needing appropriate permissions. Due to the differences in the way each activity is carried out they will be considered separately throughout the document. There is no national description of what commercial or recreational levels of collection are, therefore activity has been assessed regardless of the end point of the catch, since it is the activity linked to effort that impacts rather than whether it is commercial or recreational in nature. Hand gathering involves the collection of periwinkles or shore crab by hand from the intertidal rocky areas, which can involve turning rocks, cobbles or boulders. Cleeking is a traditional method of catching lobster involving using a long pole with a hook to tease lobsters from under rocks or in crevices. Lobster will use their claws to clamp onto the hook and are removed from the sea. The activity is highly seasonal and concentrated during the summer months. Both activities occur on rocky intertidal areas, the habitat of the target species. These activities occur along the rocky intertidal/infralittoral habitats on the North East coast within other MPAs including the Northumbria Coast SPA and Coquet to St Mary's MCZ, hand gathering activities in these sites will be assessed in other HRA and MCZ assessments carried out by NIFCA. **Hand gathering targeting shore crabs** NIFCA officers record sightings of intertidal hand work activity observed during routine patrols when a site visit coincides with low water (± 2 hours). Between January 2016 and September 2024, 154 visits to handwork locations within the BNNC SAC were made by officers. 186 individuals were observed hand gathering for winkles or shore crab. Collection of crab comprises a small proportion of hand gathering activity with less than 10% of NIFCA sightings attributed to this activity. NIFCA have received reports that shore crab are difficult to find on the rocky intertidal, with the best places being around staithes or under shelter on muddy intertidal habitats. In fact, many shore crab collectors will travel to the North West coast as collection is more efficient due to higher abundance of shore crabs found in intertidal areas there (Les Weller, pers. comms. 2020). On the North East coast, hand gathering for shore crab is typically seasonal with crab targeted when soft shelled just after moulting, which takes place in late Spring and Summer. Therefore, collection occurs in a 3-4 month period from late May to August. There have been reports that some collectors will target shore crab year-round and will keep them until they moult and can be used effective bait.

	However, anecdotal evidence suggests this practice needs a sophisticated set up and is not common in the North East. The collection of shore crabs from rocky intertidal areas will have similar impacts to hand gathering for periwinkles. Shore crab shelter under rocks or in crevices and so collectors will search these cryptic habitats turning rocks as they search. A proportion of the collection of shore crab is carried out in estuaries using artificial shelters. It has been reported that 90% of the shore crab collected within the NIFCA district is collected using artificial shelters. This is thought to be a more efficient method of collection as the target species congregates within the shelter facilitating easier collection than searching and turning rocks on intertidal rocky shores. Artificial shelters, termed fisheries aggregation devices, are placed in areas of intertidal estuarine mud and are found both within Marine Protected Areas and outside of them in the Northumberland IFCA district. No fisheries aggregations devices are placed within the BNNC SAC intertidal rocky reef habitat. This activity therefore falls outside of the remit of this assessment, however assessments for this activity in the Aln Estuary MCZ (Aln MCZ – SRA 016) and Northumberland Marine SPA (NCSPA – tLSE 038) will be carried out. **Due to the scale of the activity, it is unlikely that the collection of shore crabs from intertidal rocky reef will adversely impact the conservation objectives of these features (moderate confidence).** **Hand gathering targeting periwinkle** Hand gathering for periwinkle is carried out both commercially and recreationally within the BNNC SAC. Commercial collectors sell periwinkle through two wholesalers in Berwick where they are exported to Europe, mainly to France where there is a large market. Wholesalers only take periwinkle above the minimum market size of 12 mm. At the wholesalers, periwinkle are put through a riddle which grades them by size into small, medium and large categories (small = 12-14mm, medium = 14-17mm, large = 17+mm). Wholesalers report that they return the discards to a suitable area of rocky shore through trusted collectors and fishers. Prices offered to gatherers varies but is usually around £1/kg for small, £2/kg for medium and £3/kg for large, this can increase to £5/kg for large size classes around Christmas. Commercial collectors will collect periwinkle by hand, as described above, into ‘onion’ sacks which hold around 25kg of periwinkle. Catch data is held by wholesalers, NIFCA plan to work with wholesalers who will share this information. This can be used in the Hand Gathering Monitoring and Control Plan to understand effort and the impact of the activity. The activity has been reported to be higher in summer, with the most activity recorded in August (Tinlin McKenzie, 2018). Collection is higher over spring tides. On average, collectors carry out 5 trips per month, spending 3 hours collecting per trip. They collect, on average, 13.9 kg per trip (Tinlin McKenzie, 2018). The average periwinkle biomass removed from BNNC SAC per year is estimated to be 13,398.2 kg (Tinlin McKenzie, 2018). NIFCA officers record sightings of intertidal hand work activity observed during routine patrols when a site visit coincides with low water (± 2 hours). Between January 2016 and September 2024 154 visits to handwork locations within BNNC SAC were made by officers with hand gathering recorded on 60 of those patrols. 186 individuals were observed hand gathering for winkles or shore crab. Given the lack of collection of shore crab as outlined above, for the purpose of

	this assessment these sightings have been classed as periwinkle collection sightings. Areas where activity is known to occur in the NIFCA district has been classified as High, Medium and Low based on comparing collection pressure from the sightings data, which has been corroborated using the findings of Tinlin-McKenzie (2018) and from reports to NIFCA on activity (Annex 2). Classifications were split equally but checked to see if more natural breaks were more suitable, and against officers' knowledge. Within BNNC SAC, Berwick, Holy Island, and Seaton Point (south of Boulmer) have been categorised as high pressure (Annex 3). With the addition of information from Tinlin MacKenzie (2018), Seahouses and Newton have been classified as medium pressure although there are no sightings of collection at either area. This may be due to low patrol effort in these areas. Information from IFCOs suggest that these areas are not heavily collected sites, however NIFCA will target more patrols at these sites to confirm collection intensity. This will be monitored through the NIFCA Hand Gathering Monitoring and Control Plan. In comparison, periwinkle harvest levels described in Ireland and Scotland are estimated to be 4000 tonnes per year (McKay et al, 1997; Cummins et al., 2002). Based on the McKay estimate for Scotland the BNNC SAC would have an estimated 25 tonnes when calculated by coastline length (Tinlin McKenzie, 2018). This represents a smaller level of collection on the Northumberland Coast compared to elsewhere in the UK, although this doesn't necessarily mean a smaller impact. NIFCA currently does not have any stock assessment information to fully understand the impacts of collection at any level on the population. Periwinkle size was compared by Tinlin-McKenzie (2018) to previous studies (Morell 1976; Quigley, 1999). On the most heavily collected shore studied (Boulmer) the largest shell height had not decreased suggesting harvesting periwinkles had not led to a reduction in maximum shell height over the last 50 years. In other areas of the UK, periwinkle size and density was found not to correlate to harvesting pressures at current exploitation levels (Tilin et al., 2010). Natural variation in density between shores is likely to have a greater impact than that of harvesting. With factors such as habitat selection likely to have a greater impact (Gendron, 1977). However, Quigley (1999) revealed differences in the size distributions and mean size of periwinkle between "collected" and "uncollected" populations within the BNNC SAC, and that the maximum size attained by *Littorina* on "collected" shores was smaller than that from "uncollected" suggesting that high levels of collection could have an impact on periwinkle size. Densities on shores within the BNNC SAC have been found to vary based on collection pressure but with different directions of difference. Quigley (1999) found densities of periwinkle to be higher on two out three shores with 'high' collection rates when compared to adjacent shores with 'low' collection rates. Relatively high densities may have been sustained due to dispersive larval recruitment from other shores (Jackson, 2008) or refuge areas. Crossthwaite (2012) found that long-term exploitation did significantly affect population abundance and age structure. However, exploitation levels are higher in these study areas, which are located in Northern Ireland. Local findings suggest that periwinkle populations are maintained at harvestable levels at highly collected shores and communities likely vary from natural variation, rather than harvesting effects (Tinlin-McKenzie, 2018).

	Direct impacts of periwinkle collection to associated flora and fauna are due to: - Physical damage to flora and fauna from disturbance (Berthelon et al., 2004) from boulder turning and trampling which can cause a reduction in habitat stability and reduced biodiversity (Davenport and Davenport, 2006). This can damage under-boulder communities which require stable boulder habitats. It can also adversely impact organisms that depend on upper rock surfaces, such as seaweeds (Liddard et al., 2011). Reduction in habitat stability from boulder turning can be lethal to fauna, algae, and under-boulder communities through crushing, smothering and desiccation (Berthelon et al., 2004). - Reduction in species composition through trampling can reduce biodiversity, abundance, and biomass (JNCC and NE, 2011). It can lead to a higher percentage of bare rock with a decrease in algal cover (Tyler-Walters, 2008; Liddard et al., 2011). These effects can be seen at low trampling with long term impacts (Povey and Keough, 1991). These impacts are variable, dependent upon intensity, duration, and frequency of the trampling (JNCC and NE, 2011). - These disturbances can negatively alter community structure, they vary spatially and temporally (Berthelon et al., 2004) and most severely impact long lived sedentary species that are slow to reproduce (Berthelon et al., 2004). Although previous studies show direct impacts of rocky shore disturbance, the impacts can be difficult to predict locally. The local evidence available (Tinlin-McKenzie, 2018; Quigley, 1999) suggests that periwinkle collection, at current levels, does not appear to be negatively impacting rocky shore floral and faunal communities in the ways described above. Natural England commissioned a study investigating the scale, locale, and ecological impacts of harvesting intertidal species including periwinkles (Tinlin-McKenzie, 2018). Three shores were observed representing 'not collected', 'low collection' and 'high collection'. Results found that periwinkle collection does not appear to be negatively impacting rocky shore floral and faunal communities at current intensity levels. Quigley (1999) reported that between shores in Northumberland with different collection pressures ('collected' and 'uncollected') two out of three sites showed no significant difference in non-target animal mean abundance. Overall, periwinkle stocks appear to be relatively resilient to harvesting. As the local evidence available from peer reviewed research (Tinlin-McKenzie, 2018; Quigley, 1999) suggests the harvesting at current levels does not impact floral and faunal communities. However, literature from other areas of the UK suggest the most significant potential impacts appear to be on non-target rocky shore dwelling plants and animals which experience physical disturbance from human activities (Berthelon *et al.*, 2004; Crossthwaite, 2012). The hydrodynamics along the coastline of the BNNC SAC are variable, in more exposed areas wave and wind naturally turns some small boulders/cobbles. Thus, intertidal and infralittoral communities subject to this natural disturbance will be more resistant to disturbance pressures than communities in sheltered areas. Overall, the intertidal rocky reef feature is subject to naturally high levels of physical disturbance and recovery of rocky reef communities is predicted to be medium (Mieszkowska and Sugden, 2014). However, the impacts of boulder turning are more severe when boulders are left upturned (Davenport and Davenport, 2006; AFBI, 2009). Results from the 2022 periwinkle surveys carried out at Berwick and Boulmer suggest that periwinkle abundance, species richness or diversity is not related to periwinkle collection intensity. Signs of

	potential increased collection at Boulmer South may be a function of the increased number of patrols to the areas and should therefore continue to be monitored. The highest collection remained at Berwick, in addition to the lowest periwinkle densities. There was no overall correlation between periwinkle density and collection pressure between sites however, similar to the results in 2020. There was little change in rocky shore communities at most sites from 2020-22, with faunal and algal abundance, species richness and diversity remaining similar for most metrics. NIFCA can say with moderate confidence that on area of bedrock reef where activity is medium or low this activity will not have an adverse impact on features of the site if boulders are returned to their original position. However, NIFCA have received multiple reports that activity has increased in certain areas since 2018. Further, evidence in the literature from other areas in the UK (Northern Ireland) (Crossthwaite et al., 2012) suggest that the impact of removal of periwinkle at higher intensity levels of collection could have long term impacts to community composition and structure. Therefore, at areas of high collection, NIFCA are unsure whether this activity will significantly impact the conservation objectives of this feature, especially as there is no stock assessment information. Management could aim to ensure that collectors return all boulders to their original positions after use, or minimise boulder turning all together. This could be done using education, and codes of conduct (Boye *et al.*, 2006). Trampling may be too difficult to manage due to the free access of rocky shores to the public undertaking recreational activities. **NIFCA conclude, with moderate confidence, that this activity will not adversely impact the conservation objectives of the site, through the pressures listed above, at areas of low and medium collection. Areas classified as high collection will be taken to Appropriate Assessment.** All hand gathering will continue to be monitored through routine and target patrols throughout the district. NIFCA has implemented a Code of Conduct (Annex 3) for hand gathering for periwinkles in the district that aims to stop any adverse impacts from the activity including avoiding the collection of small (below minimum market size – 12 mm), reducing disturbance to floral and faunal communities and to birds. NIFCA will monitor adherence to this code of conduct, and if found it is not being adhered to, plan to develop management measures. **Cleeking** Cleeking is a low impact activity, those engaged in the activity walk over intertidal areas to reach the sea at low tide. The activity is highly seasonal, concentrated in summer months on big spring tides. The main damage to the marine environment will result from individuals crossing the foreshore, however given the limited and declining levels of activity this is unlikely to cause any adverse impacts. Impacts could also occur when rocks are turned over and not replaced. The hydrodynamics along the coastline of the BNNC SAC are variable, in more exposed areas wave and wind naturally turns some small boulders/cobbles. Thus, intertidal and infralittoral communities subject to this natural disturbance will be more resistant to disturbance pressures than communities in sheltered areas. Overall, the intertidal rocky reef feature is subject to naturally high levels of physical disturbance and recovery of rocky reef communities is predicted to be medium (Mieszkowska and Sugden, 2014). Plus, given the limited and declining levels of activity this is unlikely to cause any adverse impacts.

<table>
<tr><td></td><td>Activity is relatively low in areas of the BNNC SAC. There were 110 patrols to potential cleeking locations within BNNC SAC between January 2016 and September 2024 with cleeking seen on 16 of those patrols. 34 individuals were recorded cleeking. From these activity levels, effort is inferred to be low. The activity is labour intensive and anecdotally it is in decline as younger generations are not partaking in this traditional activity.

Further NIFCA byelaws limit the activity: NIFCA Byelaw 4 Crustacea Conservation limits the number of lobster that can be taken using this method to one per person per day.

At current declining levels, cleeking in the intertidal zone is unlikely to cause significant adverse impacts to the conservation objectives of this site through the pressures listed above.

NIFCA conclude, with moderate confidence, that this activity will not adversely impact the conservation objectives of the site through the pressures listed above.</td></tr>
<tr><td>6. Condition and Conservation Objective Inferences</td><td>Conservation advice for BNNC SAC give a conservation objective of Maintain for ‘Intertidal rock’. This sub-feature of ‘intertidal rock should be maintained at 6,936 ha.

The Conservation Advice package suggests that there is evidence from survey or monitoring that shows the features/subfeatures to be in a good condition.</td></tr>
<tr><td>7. Is the potential scale or magnitude of any effect likely to be significant?</td><td>Alone:<table><tr><td></td><td>Intertidal rock</td></tr><tr><td>Periwinkle collection</td><td>No (Low/medium collection areas)
Yes (high collection areas</td></tr><tr><td>Shore crab collection</td><td>No</td></tr><tr><td>Cleeking</td><td>No</td></tr></table>OR In-combination

No in low/medium collection areas (Annex 5).

Uncertain in high collection area. An in-combination assessment will be carried out as part of an Appropriate Assessment.</td></tr>
<tr><td>8. Have NE been consulted on this LSE test? If yes, what was NE’s advice?</td><td>Yes. NE advise appropriate assessment.</td></tr>
</table>

Conclusion

Is the proposal likely to have a significant effect 'alone or in combination' on the Berwick to North Northumberland Coast SAC?

Uncertain. Alone and in combination with other plans/projects in low and medium pressure collection areas NIFCA have concluded the hand gathering will not have any effect likely to be significant on the above features. For the areas of high collection pressure NIFCA will conduct an Appropriate Assessment. Effort will be monitored throughout the

NIFCA district and changes in effort in high, medium and low areas will be recorded in the Hand Gathering monitoring and control plan with management put in place if appropriate.

Test for Likely Significant Effect (LSE)

BNNC SAC – 227 Intertidal biogenic reef - mussels

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	No
2. What pressures (such as abrasion, disturbance) are potentially exerted by the gear type(s)? 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 current Conservation Advice available on Natural England's Designated Site System.	**Abrasion/disturbance of the substrate on the surface of the seabed** **Habitat structure changes - removal of substratum (extraction)** **Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion** **Removal of non-target species** **Removal of target species** Introduction or spread of invasive non-indigenous species (INIS)
3. Is the feature potentially exposed to the pressure(s)?	Yes

4. What are the conservation objectives for the feature?	The conservation objectives for 'Intertidal' supporting habitat for designated bird feature(s) are set to: **Restore:** - The total extent and spatial distribution of mussel beds within the site, and recover the extent of the mussel bed at Fenham flats (Ross) to greater than 40 ha - Restore a balanced age / size frequency and distribution within the population across the extent of the subfeature, to increase resilience and encourage a healthy, productive population. - Restore the density of mussels. **Reduce** - Reduce aqueous contaminants to levels equating to High Status **Maintain** - Maintain the presence and spatial distribution of reef communities - Maintain the total extent, spatial distribution of the mussel beds within the site - Maintain the area of habitat that is likely to support the feature, allowing for natural change and the dynamic nature of the habitat. - Maintain the species composition of the mussel bed community. - Maintain the natural physico-chemical properties of the water. - Maintain the natural rate of sediment deposition. - Maintain the natural water flow velocity to the intertidal mussel beds, to provide high levels of oxygen and food and prevent 'mussel mud' forming. - Maintain the dissolved oxygen (DO) concentration at levels equating to High Ecological Status - Maintain water quality at mean winter dissolved inorganic nitrogen levels - Maintain natural levels of turbidity (eg concentrations of suspended sediment, plankton and other material) across the habitat. **Restrict** - Restrict the introduction and spread of non-native species and pathogens, and their impacts.

5. What are the potential effects/impacts of the pressure(s) on the feature, taking into account the exposure level?	The BNNC SAC boundary from North of the Northumberland IFCA district boundary at Fast Castle Head to just north of Alnmouth. The other sections of this document consider the following types of hand gathering activity: the collection of periwinkles or shore crab by hand and cleeking for lobster on the intertidal rocky areas (information about hand gathering for seaweed can also be found in the section above). This section assesses all hand gathering activity from mussel beds. Mussel beds can attach to a variety of substrata including algae on shores of pebbles, gravel, sand, mud and shell debris. If conditions are right, mussel beds can form, creating biogenic reefs. At various locations on the Northumberland Coast mussel spat settles, however due to the dynamic nature of the coastline, spat gets washed away before forming a 'mussel bed'. There are formed mussel beds at Holy Island, Fenham Flats (both located within Lindisfarne National Nature Reserve LNNR) and on the Blyth Estuary (outside of the BNNC SAC). Mussels are collected for bait on the Northumberland Coast, this is reported to be both commercially and recreationally. There are no mussel beds prosecuted commercially for food consumption in the NIFCA district. Fenham Flats and Holy Island Sands mussel beds are located within Lindisfarne National Nature Reserve (LNNR). The LNNR has byelaws which prohibit the collection of organisms for bait, and therefore mussels. Levels of mussel collection at beds within the LNNR are low, any collection is a contravention of that byelaw. Fenham Flats is difficult to access which can further deter collection from this bed. The bed close to Holy Island is more accessible, however collection of mussel is reported to be low (Andrew Craggs, pers. comms.). **NIFCA conclude, with high confidence, that this activity could adversely impact the conservation objectives of the site through the pressures listed above. However, at current levels (i.e. no activity) NIFCA conclude with high confidence that there is currently no impact to the conservation objectives of the site.**

6. Condition and Conservation Objective Inferences

Northumberland IFCA carry out annual monitoring surveys on the following mussel beds in the BNNC SAC: Holy Island Sands and Fenham Flats.

Survey results from March 2024 indicated that percentage cover at Fenham Flats and Holy Island were the lowest recorded since surveys began in 2006 (Table 1) and 2018 (Table 2).

The estimated values obtained for density, biomass and total number of mussels have decreased significantly compared to the 2023 surveys at both sites. However, mean mussel length at Fenham Flats has continued to follow an increasing trend, in contrast to mean mussel length at Holy Island which was lower than in previous years, exhibiting a pattern of decline.

Table 1: Results for the Fenham Flats mussel survey between 2006 and 2024.

Year	Bed area (ha)	Average % cover	Total number of mussels (millions)	Mean shell length (mm)	Mussel density (no./m^2)	Biomass (g/m^2)	Total biomass (tonnes)
2006	41.53	60	133.6	41	321.6	4,480	1,861
2007	37.18	79.81	193.2	45	519.5	8,396	3,122
2008	36.72	78.58	338.5	40	921.7	12,895	4,734
2009	34.43	72.1	288.5	34.5	837.8	9,020	3,105
2010	36.28	78.41	376.4	34.7	1037.3	9,974	3,618
2011	45.65	64.91	243.6	36	533.5	5,498	2,510
2012	43.8	67.9	178.1	43.5	406.7	5,364	2,349
2013	41.3	66.5	128.8	48.2	311.8	5,642	2,330
2014	31.82	54.84	95.6	47.42	300.5	5,776	1,838
2015	40.49	69.01	147.3	49.56	363.6	7,232	2,928
2016	44.9	59.95	115.1	51.2	230.2	5,916	2,654
2017	42.9	58.61	58.4	55.5	145.9	4,822	2,068
2018	39.7	54.8	62.2	50.76	156.61	4,336	3,141
2019	46	41.8	31.0	57.83	67.3	2,503	1,151
2020	52.66	42.9	15.1	59.95	28.74	971	511
2021	46.58	43.47	13.6	44.67	29.12	828	386
2022	46.58*	17.39	2.1*	47.35	4.43*	149	70*
2023	48.10	4.37	0.2	48.32	0.52	19	9
2024	20.81	3.67	0.1	52.89	0.51	20	4

*calculated using 2021 bed area

Table 2: Results for the Holy Island mussel survey between 2018 and 2024.

Year	Bed area (ha)	Average % cover	Total number of mussels (millions)	Mean shell length (mm)	Mussel density (no./m^2)	Biomass (g/m^2)	Total biomass (tonnes)
2018	3.11	90	8.58	35.15	276.0	3,749	116.58
2019	4.04	66	5.07	48.08	125.4	2,314	93.48
2020	4.02	75	4.31	48.29	107.25	2,072	83.3
2021	3.59	59	2.52	40.64	70.31	1,188	42.66
2022	3.41	70	0.86	42.02	25.2	496	16.92
2023	3.01	11.5	0.06	46	1.88	40	1
2024	2.53	6.27	0.03	35.79	1.10	17	0.43

The Lindisfarne mussel beds at Fenham Flats and Holy Island have continued to exhibit a pattern of decline across all of the metrics collected during the annual mussel survey. The cause of this decline is still unknown, however future surveys will aim to continue to monitor these trends and will guide further investigation into the driver of this decline.

7. Is the potential scale or magnitude of any effect likely to be significant?	**Alone:** **No – because there is no current fishery**	**OR In-combination** **Uncertain, see conclusion.**
8. Have NE been consulted on this LSE test? If yes, what was NE's advice?	Yes. NE concur that the *Mytilus edulis* biogenic reef (mussel bed) is in decline.	

Conclusion

Is the proposal likely to have a significant effect 'alone or in combination' on the Berwick to North Northumberland Coast SAC?

NIFCA conclude, with high confidence, that this activity alone could adversely impact the conservation objectives of the site through the pressures listed above. However, at current levels (i.e. no activity) NIFCA conclude with high confidence that there is currently no impact to the conservation objectives of the site.

NIFCA are uncertain about the in-combination effects (Annex 5) at present this activity does not occur, as such there is no pathway for in combination effects with other plans and projects. Should a commercial fishery be proposed, this would require reassessment and would be unlikely to be sustainable.

References

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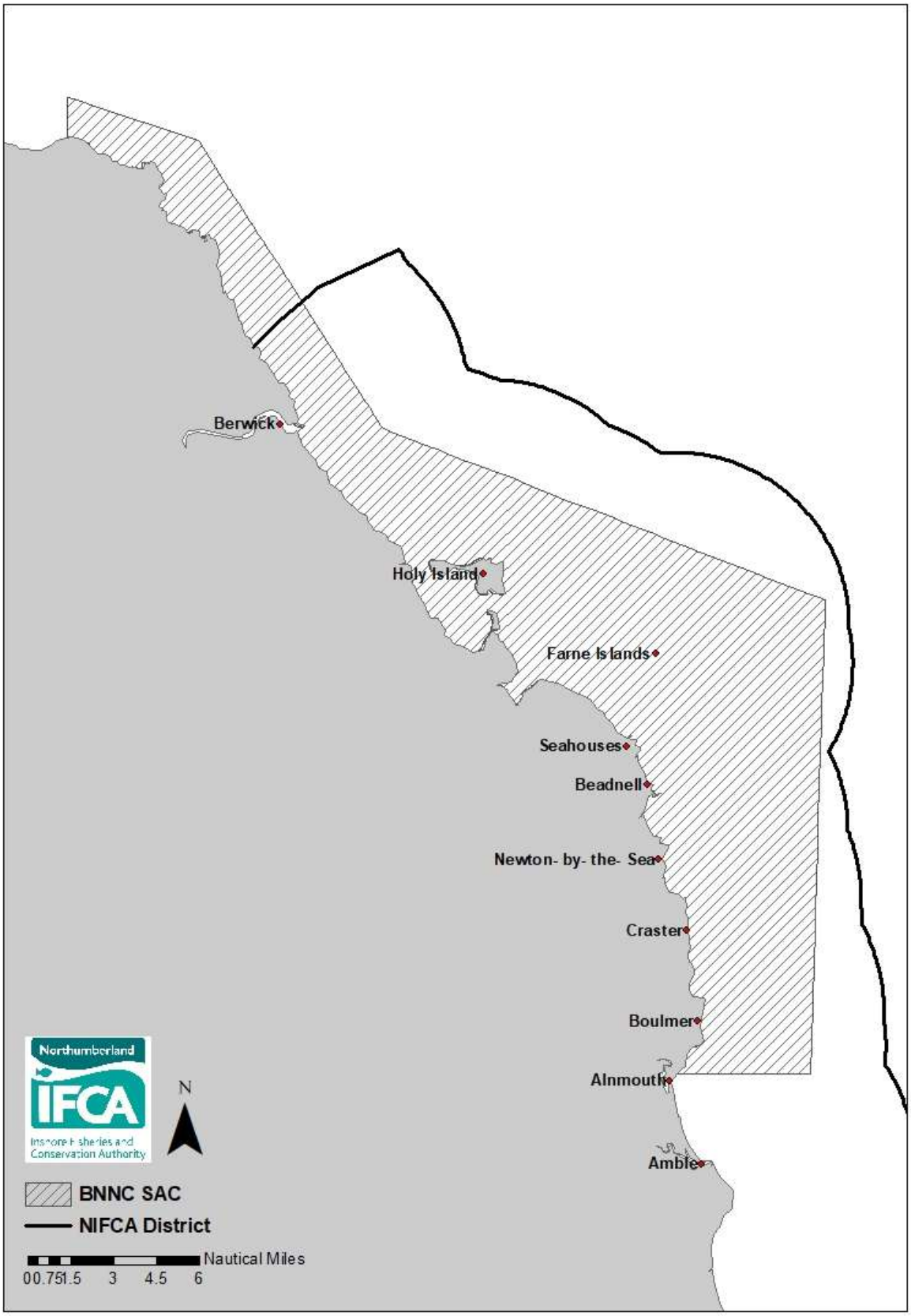
Annex 1 - Berwickshire and North Northumberland Coast SAC map



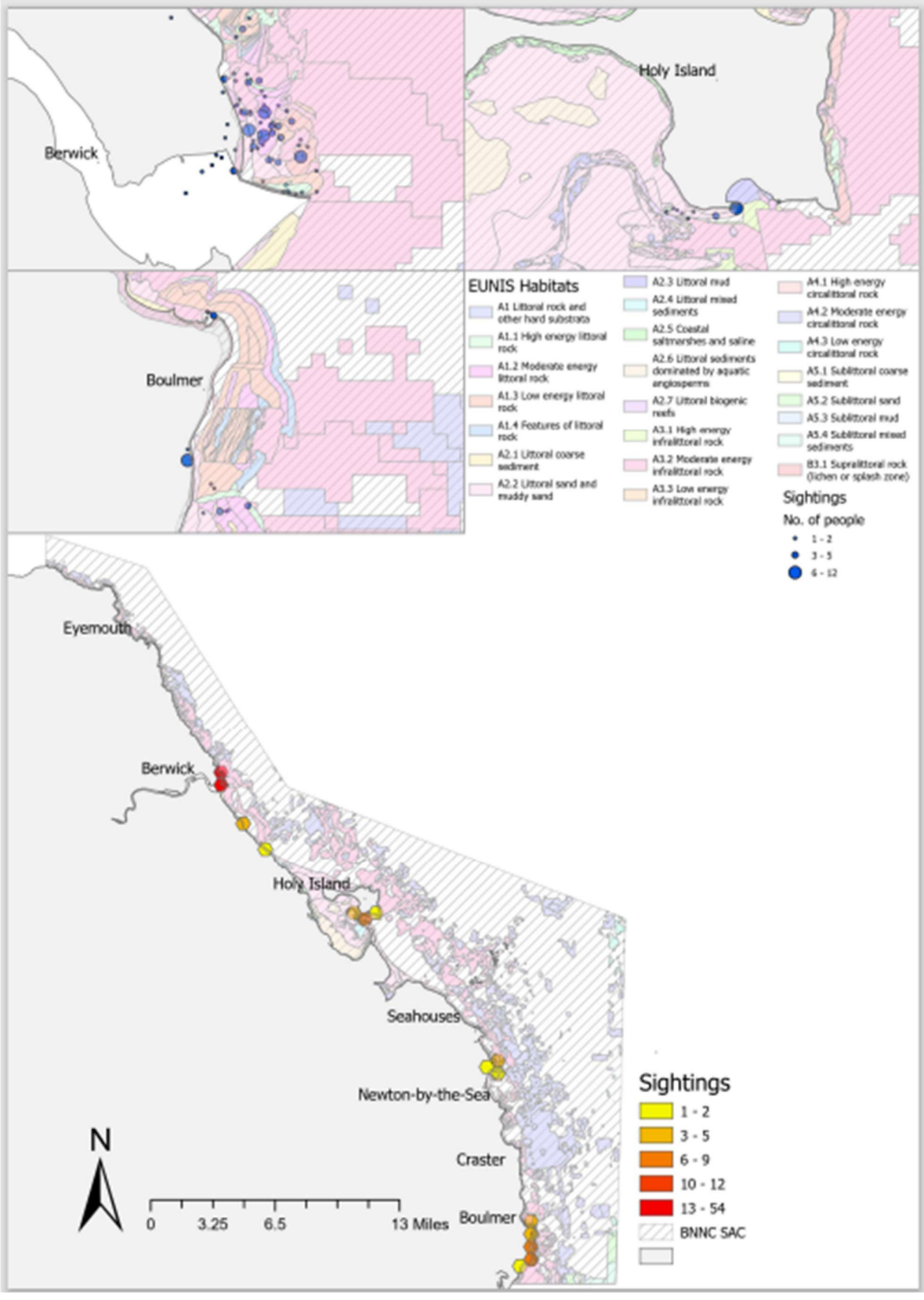
Annex 2 – Periwinkle gathering activity

Periwinkle gathering activity classifications for all sites within the BNNC SAC from NIFCA intertidal patrols between 2016 and September 2024. Showing total number of patrols, the proportion of patrols periwinkle collection was sighted on, the average number of individuals per sighting, the average number of individuals per patrol (proportion of patrols x average number per sighting) and the maximum number of collectors sighted at one time. Periwinkle activity rankings (Low – High) were based on average number of collectors per patrol to the area from NIFCA patrols, in addition to officer knowledge. Further to these sightings Seahouses and Newton have been identified as medium areas of collection intensity (Tinlin MacKenzie, 2018). There have been no sightings in these areas during NIFCA patrols, these sites will be prioritised for NIFCA patrols in the future.

Site	Number of patrols	Proportion of patrols activity sighted	Average no. of collectors per sighting	Average no. of collectors per patrol	Max. no of collectors	Periwinkle collection activity
Beadnell	25	0.20	1.60	0.32	2	Low
Berwick	60	0.78	2.51	1.97	8	High
Boulmer N	73	0.14	2.40	0.33	6	Low
Foxton - Seaton Point	9	0.11	2.00	0.22	2	Low
LNNR / Holy Island	19	0.47	2.00	0.95	7	Medium
Boulmer S /Seaton Point	13	0.62	2.63	1.62	4	High

Annex 3

Number of periwinkle collection sightings within the BNNC SAC from NIFCA patrols from 2016-2024 showing sighting hotspots at Berwick, Holy Island, and Boulmer (Seaton Point) on rocky intertidal habitats.



Annex 4

Northumberland IFCA Code of Conduct for periwinkle gatherers.

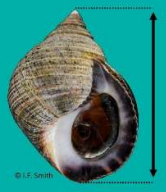
Northumberland IFCA Periwinkle Gathering Code of Conduct

PURPOSE

Collecting periwinkles in large numbers has the potential to damage seaweed and animals found on the rocky shore. Bird life can also be harmed by taking their food resources and causing disturbance.

To reduce these impacts **the guidelines listed below should be followed** by any person removing periwinkles. These guidelines apply to the coastline from the River Tyne to the Scottish border.

GUIDELINES



1. Do not create unnecessary disturbance:
   - rocks that are moved to search for or collect periwinkles should be replaced,
   - Care should be taken not to damage or displace any living organism.
   - Avoid bird disturbance in important feeding and resting areas.
2. Only collect periwinkles above 12 mm (minimum size taken by local wholesalers) to avoid taking juvenile periwinkles.
3. Sort out and return small periwinkles (under 12mm) as close as possible to area of collection. Northumberland IFCA recommends using a sieve or riddle constructed of rigid mesh or bars spaced at least 12 mm apart to separate out smaller winkles.
4. Periwinkles should be measured across the height of the shell from tip to tip (see diagram).
5. Only collect edible periwinkles and no other similar looking species (see guide below).

EDIBLE PERIWINKLE GUIDE

Periwinkles are usually black/ dark grey-brown in colour with a white interior around the mouth

They are usually around 2-3 cm high

They have a smooth or slightly ribbed shell which extends to a pointed tip.

Northumberland IFCA will monitor the collection of periwinkles to check whether th ıts listed above are followed. If they are not, this may result in the application of statutory ıures.

For more information please visit: www.nifca.gov.uk

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Annex 5 In combination assessment

Plans and Projects			
Activity	**Description**	**Assessment**	**Potential Pressure**
Fishing	Potting In 2016 NIFCA introduced a recreational potting permit which will enable NIFCA to monitor levels of recreational potting within the district. Each permit holders is permitted to fish up to 5 pots within the NIFCA district and can only take 2 lobster (5 brown or velvet crabs, 20 whelks or 5 prawns) per day. In 2019 there were 204 recreational permit holders	A significant proportion of recreational pots are fished within the infralittoral zone from the shore with little overlap with into the intertidal. Recreational potting is often seasonal and carried out infrequently. Activities are unlikely to co-occur on reef features.	Recreational potting occurs on rocky infralittoral areas throughout the SAC. This activity is small scale in comparison to commercial potting activity. In 2023, NIFCA had 272 registered recreational potting permit holders, as each permit holder is only allowed a maximum of 5 pots this results in a total of 1,360 pots. Cleeking is likely to occur in a similar location to recreational potting, however activity is very low level. Whilst there may some spatial overlap between recreational potting and periwinkle collection these activities are targeting different species. NIFCA does not therefore consider that there will be an in-combination effect of these activities. The vast majority of commercial potting will not be co-located with the activities assessed here.
Aquaculture	Pacific Oyster Aquaculture There is a pacific oyster aquaculture operation located on Fenham Flats in Lindisfarne NNR. Oysters are grown in net bags which are supported by trestles. Trestles are arranged in rows and grouped mainly on the northern edge of the bed.	The operation is co-located with the mussel bed. There has been suggestion that the presence of the oyster aquaculture operation could have a negative impact on the mussel bed, mainly through competition for food resource (Cucci, 1997; Dame & Prins, 1997; Forrest et al., 2009; Leguerrier et al., 2004; Tran et al., 2022; Troost et al., 2009). It is difficult to determine if the combination of aquaculture and other factors are contributing to a decline of the mussel beds.	The operation is consented through Natural England's consenting process in SSSIs. Natural England monitor the size of the operation through regular surveys. They work with the owners to identify and mitigate any areas of concern.
Coastal Infrastructure	Outflow pipes Maintenance	Appropriate licence conditions/monitoring has been incorporated to mitigate any impacts.	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.

Coastal management scheme - Northumberland and North Tyneside Shoreline Management Plan 2 (05/2009) covers the coastline from the Scottish border to the River Tyne.	Flood and erosion risk management	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 impacts to BNNCSAC.	Any coastal management works along the coast under the aegis of a Coastal Management Scheme.
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 BNNCSAC.	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**
Recreational Angling from Vessels	NIFCA record sightings of angling vessels observed during patrols since 2001. This data was provided to the MMO MCSS MPA activity monitoring trial (begin 09/16).	NIFCA consider recreational angling to be a relatively small-scale activity, with only 148 sightings of recreational angling vessels in 2016 compared to 680 sightings of commercial potting vessels.	Recreational angling is targeting seafish and not gastropods such as periwinkles. There will also be no spatial overlap with intertidal collection. NIFCA therefore conclude that there will not be an in-combination effect with periwinkle collection.
Intertidal Recreational Activity: Rock pooling	The rocky intertidal areas of BNNCSAC are popular rock pooling spots. This activity is highly seasonal occurring in the summer months over low tide.	In certain areas where rock pooling activity is high, there is a potential in combination impact from rock pooling and periwinkle gathering activities.	Impacts are likely to be similar to those caused by intertidal hand gathering where rocks are turned and cryptic habitats searched.