

PROTECTING THE NORTH SEA: HOLDERNESS



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CREDITS

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Cover: Blood star (*Henricia sanguinolenta*) and hornwrack (*Flustra foliacea*)
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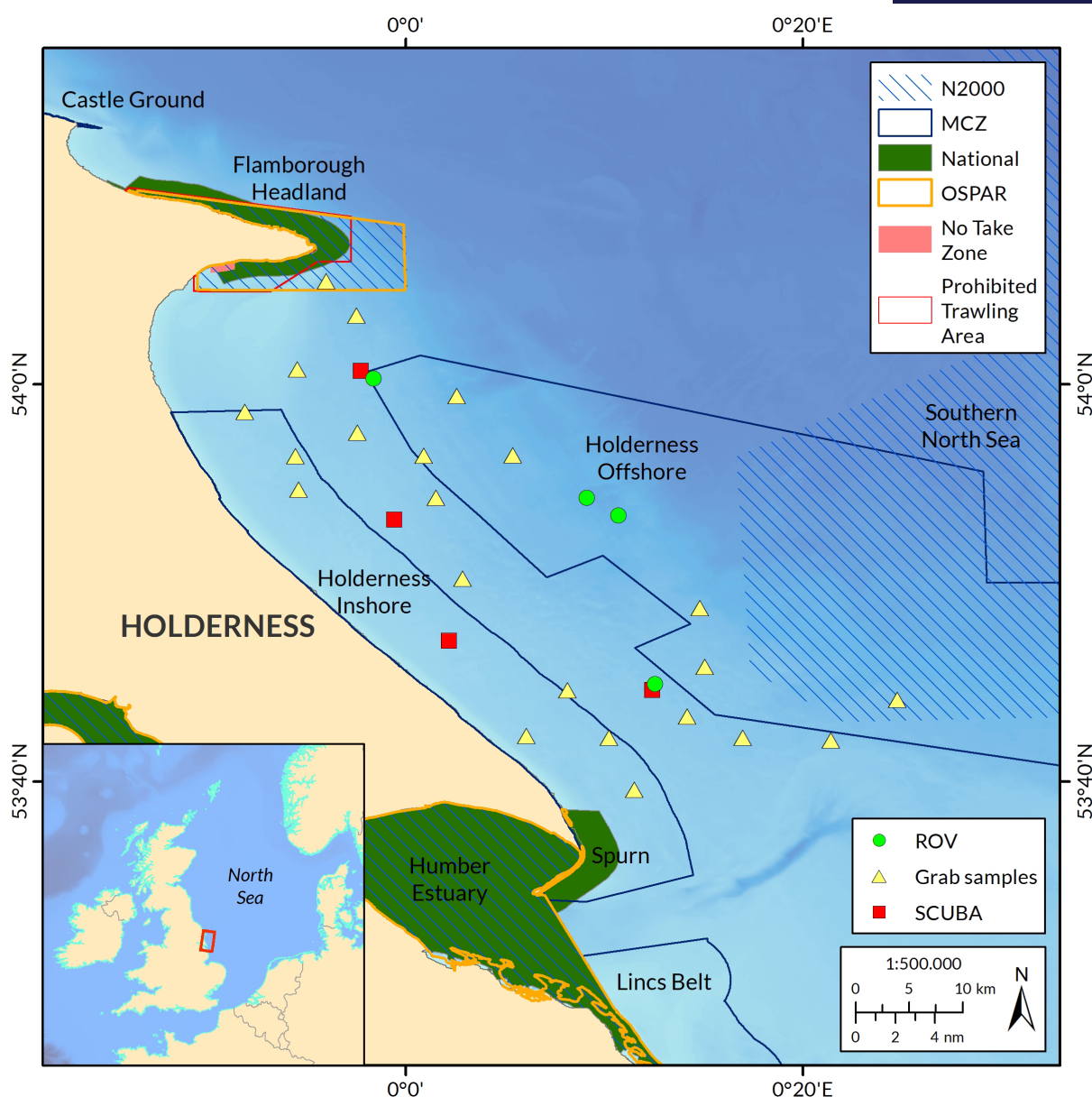
European edible sea urchin (*Echinus esculentus*) © OCEANA / Juan Cuetos

INTRODUCTION and FINDINGS

The waters off Holderness, north of the Humber Estuary on the Yorkshire coast, represent a very rich area in terms of marine biodiversity. This is partly due to the mosaic of substrate types found in the area, which range from rocky bottoms and coarse sediment through to mixed sediment, sand, and mud. This array of substrates supports, in turn, a wide range of benthic species, both sessile and mobile, including those that live on the surface of coarse sediments and infauna that live within softer sediments.

The ecological importance of seabed habitats and communities in these waters has led to the designation of three marine protected areas (MPAs) in the Holderness area (Fig.1). *Holderness Inshore* Marine Conservation Zone (MCZ) was designated in 2016 to protect a range of seven habitat features that support a diversity of fauna, including commercially important species such as European eel and edible crab.¹ More recently, in 2019, *Holderness Offshore* MCZ was also designated as a protected area,² with spawning and nursery grounds for commercially fished species of crustaceans and fishes,^{3,4} foraging habitat for seabirds, and records of basking sharks and ocean quahog. To the north of the area is *Flamborough Head*, a Natura 2000 and OSPAR MPA that contains boulder reefs, underwater caves, and sandbanks.⁵ The area also supports significant seabird colonies, and whales and dolphins have been spotted in its waters.⁶ *Flamborough Head* encompasses a small (1 km²) no-take zone in which the removal of fishes, shellfish, and marine plants is strictly prohibited;⁷ and another area (38 km²) in which all trawling activities are prohibited.⁸

To help advance marine conservation and management in the area of Holderness, Oceana carried out research surveys in 2016, which focused mainly on animal life on the seabed (Box 1). Surveys were conducted both inside protected areas (*Flamborough Head* and *Holderness Inshore*) and outside protected areas: in the waters of *Holderness Offshore* (which at the time had been recommended but not proposed for protection) and in the still-unprotected corridor between *Holderness Inshore* and *Holderness Offshore*. The main objective of this research was to gather additional data to support the designation of *Holderness Offshore*, given what was already known about the ecological importance of the Holderness area.



Box 1. Protecting the North Sea: Oceana Expeditions 2016 & 2017

Oceana carried out two eight-week research expeditions, in 2016 and 2017, to document the richness of marine life in the North Sea. The main objective was to collect data about seafloor habitats and species in areas of potential ecological importance, in the interest of strengthening the network of marine protected areas (MPAs) in the North Sea.

Holderness was surveyed as part of the 2016 expedition, which encompassed a total of 13 areas across the waters of Denmark, the Netherlands, Norway, and the United Kingdom. Surveys were carried out through filming with a remotely operated vehicle (ROV) and by SCUBA divers, and infaunal sampling using a Van Veen grab.

Figure 1. Oceana sampling locations in the Holderness area, shown according to sampling method. Marine protected areas that are designated (wholly or in part) for seabed protection are shown by type. (N2000: Natura 2000 MPA designated under the Habitats Directive;⁹ MCZ: Marine Conservation Zone). Sources: EMODnet,¹⁰ EEA,¹¹ NEIFCA,^{7,8} Natural England,¹² and OSPAR.¹³

Study area: Holderness

Dates: 16-22 July 2016

Research vessel: *MV Neptune*, a fully equipped vessel of 49.85 m overall length and 10 m extreme breadth.

Surveys: 30 stations

- ROV Surveys: Four transects to document species and habitats, with a Saab Seaeye Falcon DR ROV, equipped with a high-definition camera (1920 x 1080 resolution).
- SCUBA Surveys: Four dives by a team of four divers (a photographer, a videographer, and two security divers), to document species and habitats in shallow waters.
- Infaunal Surveys: 22 grab samples collected with a 12L Van Veen grab, to identify fauna living on and within the sediment.
- Biological samples: 87, comprising mainly crustaceans, molluscs, and worms.
- Depth range: 6-39 m

FINDINGS

Oceana documented a total of 250 taxa in the Holderness area, of which 184 were identified to the species level (see *Identified Animal Species*). Below, the key findings are presented according to the primary habitat types documented, and the main species that were associated with them.

HABITAT TYPES AND ASSOCIATED COMMUNITIES

Mixed sediment with coarse sand and scattered boulders, cobbles and pebbles

This type of habitat was widespread across the Holderness region, inside both *Holderness Inshore* and *Holderness Offshore*, and along the unprotected corridor.

The seabed was characterised by detritic sand with ripples, areas with cobbles and pebbles (the density of which was variable along survey transects), and occasional boulders. Sessile invertebrates were abundant on stones of all sizes, from pebbles to boulders, dominated by the large bryozoans *Flustra foliacea* and *Alcyonidium diaphanum*, and large, healthy colonies of the soft coral *Alcyonium digitatum*. Boulders and cobbles were in some cases covered by red algae. Within sediment samples, the most frequently found species was common porcelain crab (*Pisidia longicornis*), followed by the molluscs *Abra alba*,

Steromphala cineraria, and *Mimachlamys varia*. Remains of the long-lived bivalve *Arctica islandica* (ocean quahog) were found inside *Holderness Offshore* and in the unprotected corridor.

Within this broad habitat category, Oceana documented the occurrence of five specific sub-types that are listed as priority habitats for conservation: *Fragile sponge and anthozoans on subtidal rocky habitat*, *Reefs*, *Sublittoral sand*, *Sublittoral coarse sediment*, and *Sublittoral mixed sediments* (see Table 1 and Figure 2).

Rocky bottom with boulders, cobbles and pebbles

This type of habitat was widespread, documented inside *Holderness Inshore* and *Holderness Offshore*, at the only surveyed point inside *Flamborough Head*, and in the unprotected corridor.

Stones were covered by the large bryozoan *Flustra foliacea*, to varying degrees across the area; it was more abundant in the north of the Holderness area than in the south, where cobbles were mainly covered by hydrozoans, such as sea beard (*Nemertesia antennina*). Dead man's fingers (*Alcyonium digitatum*) were occasionally found growing on the rocks in these areas. Other frequently found species were sea squirts, such as *Dendrodoa grossularia* and *Clavelina lepadiformis*, and sea chervil (*Alcyonidium diaphanum*). Some stones were densely covered by red algae.

In the southwestern part of the study area, inside *Holderness Inshore*, rocks were covered by red algae and hydrozoans such as *N. antennina* and *Aglaophenia* sp. This habitat supported a rich diversity of species, especially crustaceans such as edible crab (*Cancer pagurus*), common lobster (*Homarus gammarus*), and velvet swimming crab (*Necora puber*), as well as fishes (e.g., *Pholis gunnellus*, *Scyliorhinus canicula*), echinoderms (i.e., *Henricia sanguinolenta*), cnidarians (e.g., *Hydrallmania falcata*, *Urticina felina*), and other invertebrates.

This type of bottom was also present in some locations along the unprotected corridor, which was rich in biodiversity. Rocks were mainly covered by red algae and hydrozoans, and various species of cnidarians and sponges colonised the stones, forming habitats for many other species. Animals of particular interest documented in association with rocky bottoms in the corridor included both commercial and protected species. For example, records included ling (*Molva molva*) and adult and juvenile cod (*Gadus morhua*). Two marine mammal species (harbour porpoise (*Phocoena phocoena*) and grey seal (*Halichoerus grypus*)) were also spotted from the surface during SCUBA surveys of rocky bottoms in this area.

The rocky bottom areas documented by Oceana included three specific habitat types that are considered conservation priorities: *Reefs*, *Sublittoral coarse sediment*, and *Fragile sponge and anthozoan communities on subtidal rocky habitat* (see Table 1 and Figure 2).



Rocks covered with various invertebrates, collected in a grab sample in Holderness.

© OCEANA / Juan Cuetos

Sandy bottoms

Only two zones of sand have been mapped by EMODnet¹⁰ in the Holderness marine area. In one of these two zones, which encompasses parts of both *Holderness Inshore* and the unprotected corridor, Oceana documented sand without any type of gravel via two shallow grab surveys (7-8 m depth). The main species collected in these samples were bivalves such as shiny nutclam (*Nucula nitidosa*) and semi-striated tellin (*Fabulina fabula*).

These areas fall under the specific habitat type *Sublittoral sand*, which is a habitat of conservation interest (see Table 1 and Figure 2).

FEATURES OF CONSERVATION INTEREST

A total of ten priority species and habitats were recorded in Holderness waters during Oceana's surveys. These features are recognised as threatened, rare, declining and/or protected, under UK and international conservation frameworks, as shown in Table 1.

Five priority species were recorded. The ocean quahog (*Arctica islandica*; Box 2), which is protected in the North Sea under OSPAR, was documented inside *Holderness Offshore* and also in the unprotected corridor. Two threatened and/or protected marine mammal species (i.e., *Halichoerus grypus* and *Phocoena phocoena*) were both observed in the unprotected corridor. Also documented were two priority commercial species: cod (*Gadus morhua*), which was recently assessed as overfished in the North Sea, and for which a 60% reduction in catches has been recommended;¹⁴ and ling (*Molva molva*), another important species for which the status of the stock in the central North Sea has not been assessed.

Oceana also documented five priority habitat types in the area. *Flamborough Head*, *Holderness Inshore* and *Holderness Offshore* have been designated as MPAs due to the presence, among other features, of priority seabed habitats for conservation, such as *Reefs*, *Submerged or partially submerged caves*, *Subtidal sand*, *Subtidal coarse sediment*, and *Subtidal mixed sediments*. These habitat types (with the exception of caves) were all documented by Oceana, both inside the protected areas and in the unprotected corridor.

An additional habitat of conservation importance was documented in one location inside *Holderness Offshore*, and in four locations in the unprotected corridor. *Fragile sponge and anthozoan communities on subtidal rocky habitats* (Box 3) are considered a sensitive habitat that requires targeted protection. Species that are characteristic of this habitat were found in some locations on rocky bottoms, including sponges such as *Cliona celata*, *Dysidea fragilis*, *Hemimycale columella* and *Polymastia* sp.; dahlia anemone (*Urticina felina*); and hydrozoans such as *Aglaophenia* sp., *Hydrallmania falcata*, *Nemertesia antennina*, and *Sertularella* sp. Additional sponge species were documented in these and other survey locations, where they co-occurred with anthozoans, hydrozoans and bryozoans, but those sponges are not listed as characteristic species for the habitat.¹⁵

It should also be noted that shells of several species of large molluscs were documented in the surveyed area. Blue mussels (*Mytilus edulis*) and horse mussels (*Modiolus modiolus*) were collected in three grab samples in the Holderness area – *M. edulis* in *Holderness Inshore* and the corridor, and *M. modiolus* in *Holderness Offshore*. Arctic roughmya (*Panomya norvegica*) shells were also collected in grab samples from *Holderness Inshore*,

Holderness Offshore, and the corridor. While these species are not protected, they are of ecological relevance because of the habitats that they form. Moreover, blue mussel beds and horse mussel beds are listed under various UK conservation frameworks and are protected under OSPAR.¹⁶ Further research would be needed to determine whether any such biogenic reefs are present in the Holderness area.

FEATURES	INTERNATIONAL FRAMEWORKS			NATIONAL FRAMEWORKS			
	HD ⁹	OSPAR ¹⁶	RL ^{17,18}	FOCI ¹⁹	CHSR ²⁰	NERC ²¹	WCA ²²
Habitats	Subtidal sand		EN	✓		✓	
	Subtidal coarse sediment		VU	✓		✓	
	Subtidal mixed sediments		VU	✓			
	Reefs	✓			✓		
	Fragile sponge and anthozoan communities on subtidal rocky habitats	✓		✓		✓	
Species	Ocean quahog (<i>Arctica islandica</i>)		✓	✓			
	Grey seal (<i>Halichoerus grypus</i>)	✓					
	Harbour porpoise (<i>Phocoena phocoena</i>)	✓	✓	VU	✓	✓	✓
	Cod (<i>Gadus morhua</i>)		✓			✓	
	Ling (<i>Molva molva</i>)					✓	

Table 1. Features documented by Oceana in Holderness that are listed as protected, threatened and/or priorities for conservation. HD: Habitats Directive; OSPAR: OSPAR List of Threatened and/or Declining Species and Habitats; RL: IUCN Red List of Threatened Species and European Red List of Habitats; VU: Vulnerable; EN: Endangered; FOCI: Features of Conservation Importance; CHSR: The Conservation of Habitats and Species Regulations 2010; NERC: Natural Environment and Rural Communities Act 2006; WCA: Wildlife and Countryside Act 1981.

Boulders

Large stones, whether isolated or part of a broader rocky seascape, form reefs that give shelter to mobile animals such as fishes and crustaceans and provide a wide range of invertebrates with a surface upon which to settle.



Boulder with soft corals, sponges and hydrozoans
© OCEANA / Juan Cuetos

Cobbles and pebbles

Bottoms covered by these medium and small-sized stones harbour a rich diversity of species, ranging from soft sediment species such as molluscs, to species that live attached to the rocks. Sandy bottoms with pebbles are known as coarse bottoms; if covered by cobbles, then they are considered a type of reef.



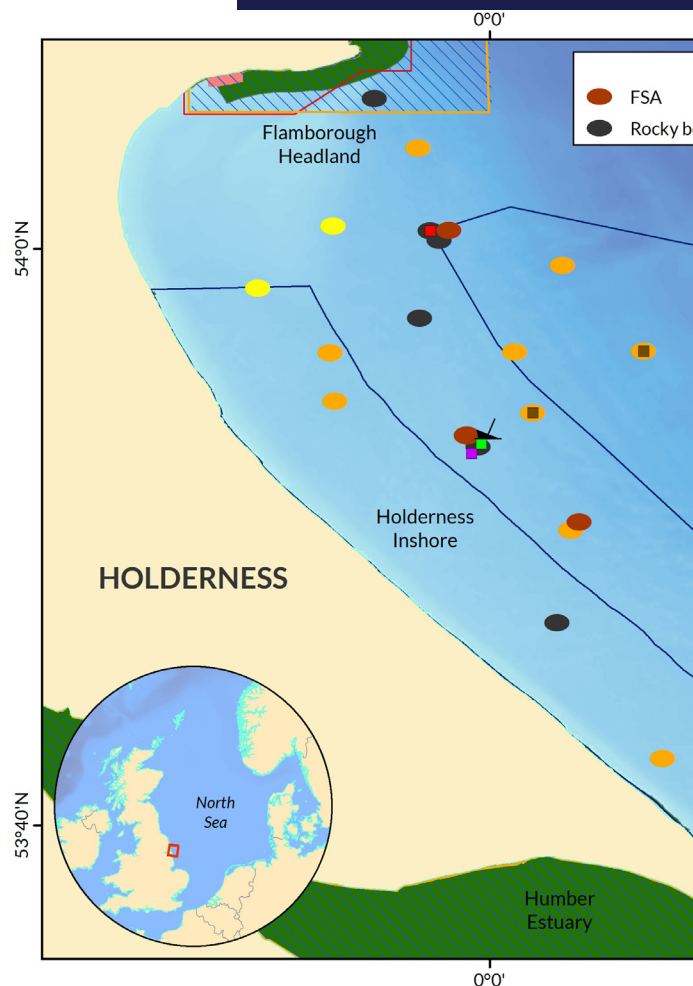
Coarse bottom with sea star (*Henricia* sp.)
© OCEANA / Juan Cuetos

Soft sediment: sand

Occasional sandy patches are found in the Holderness marine area. In some places, the sand is marked with ripples due to wave action. Mollusc shells are commonly found mixed with the sand.

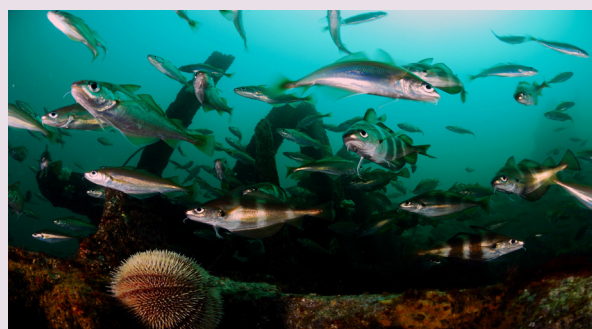


Mollusc shells © OCEANA / Juan Cuetos



The wreck

The *SS Longbenton*, a coal cargo ship sunk by a torpedo in 1917,²³ lies at 17 m depth. The wreck is a known dive site covered by soft corals, anemones, and sponges. Hydrozoans, nudibranchs, sea stars, and crustaceans inhabit the wreck, together with schools of pouting.



Pouting (*Trisopterus luscus*) and edible sea urchin (*Echinus esculentus*) on the *SS Longbenton* © OCEANA / Juan Cuetos

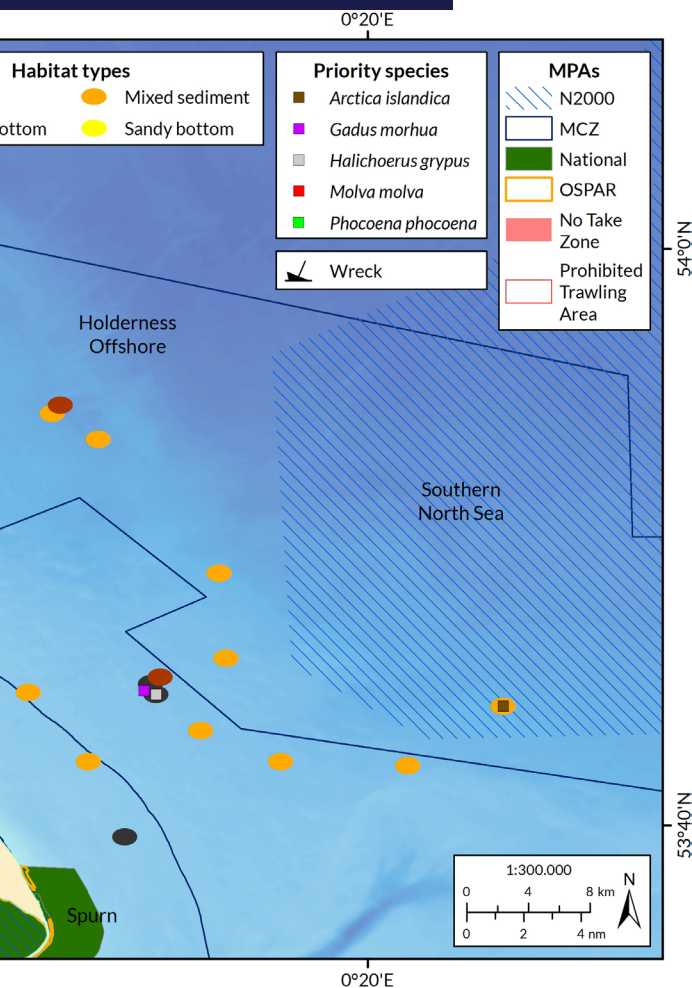


Figure 2. Key findings in Holderness during the 2016 Oceana North Sea Expedition. N2000: Natura 2000 site under the Habitats Directive;⁹ MCZ: Marine Conservation Zone. FSA: Fragile sponge and anthozoan communities on subtidal rocky habitats. Sources: EMODNet,¹⁰ EEA,¹¹ NEIFCA,^{7,8} Natural England,¹² and OSPAR.¹³

Marine mammal sightings

During the four days of surveys in the area, two sightings of harbour porpoise (*Phocoena phocoena*) and one grey seal (*Halichoerus grypus*) were recorded. All of these sightings were in the unprotected corridor.



Grey seal (*Halichoerus grypus*) © OCEANA / Juan Cuetos

Commercial species

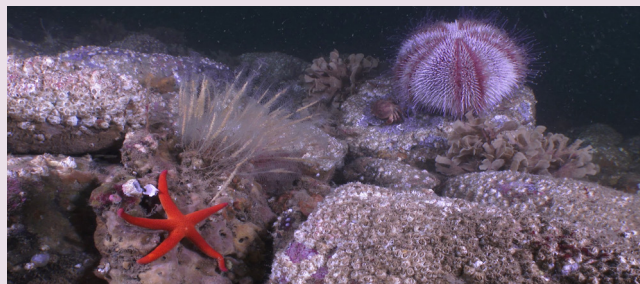
Many species of commercial interest are found in the area, such as common lobster, edible crab, cod, and ling. These species live in association with rocky bottoms, where they find shelter.



Common lobster (*Homarus gammarus*)
© OCEANA / Juan Cuetos

Habitat-forming animals

Aggregations of certain invertebrates can increase the biodiversity of an area, by creating habitats for other species. Such habitat-forming species found in Holderness include the bryozoans *Flustra foliacea* and *Alcyonidium diaphanum*, and cnidarians such as sea beard (*Nemertesia antennina*), dead man's fingers (*Alcyonium digitatum*), and plumose anemones (*Metridium senile*).



Rocks covered by barnacles, bryozoans (*Flustra foliacea*) and hydrozoans (*Nemertesia antennina*), with edible sea urchin (*Echinus esculentus*) and blood star (*Henricia sanguinolenta*) © OCEANA / J. J. Candán

Grab samples

Grab sampling provides insights into which animals live within the sediment, in a way that is not possible with only visual observations of the surface of the seafloor. Molluscs were the most abundant and diverse group collected from areas of soft sediment, while bryozoans, hydrozoans, and worms were common in hard-bottom samples.



Cobbles and large mollusc shells (*Panomya norvegica*) collected in grab sample
© OCEANA / Juan Cuetos

Box 2. *Arctica islandica*

Ocean quahog (*Arctica islandica*) is a very vulnerable species, due to its long lifespan (some individuals have been known to live for more than 500 years)²⁴ and large size (it can reach 100 millimetres in length).²⁵ Moreover, it usually lives in soft sandy bottoms, which are affected by a variety of anthropogenic impacts, in particular bottom-contact fishing. The protection of quahog is a requirement in the North Sea under the Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention'). The UK, along with other countries in the region, should take action to protect and help restore quahog populations.



Ocean quahog (*Arctica islandica*) shell (bottom right corner).
© OCEANA / Juan Cuetos

Box 3. Fragile sponge and anthozoan communities on subtidal rocky habitats

This habitat is one of 25 priority marine habitats that were originally identified as “the most threatened and requiring conservation action”, under the 1994 UK Biodiversity Action Plan.²⁶ Later, it was identified as a habitat of conservation importance that should be protected within Marine Conservation Zones.²⁷

Large and slow-growing species, such as sponges and sea fans, form this habitat. Various other sponge species can also be present, as well as bryozoans, hydrozoans and other cnidarians.²⁸ This is a rich ecosystem in which fish, crustaceans, echinoderms and many other species find food and shelter. In Holderness, large sponges such as goosebump sponge (*Dysidea fragilis*) and boring sponge (*Cliona celata*) were documented, along with anthozoans, bryozoans, hydrozoans and other sponge species that covered the rocks and created habitat for associated animals.



Goosebump sponge (*Dysidea fragilis*, at centre-right), surrounded by other sponges and red algae.

© OCEANA / J. J. Candán



Branching sponge (*Leucosolenia fragilis*)

© OCEANA / J. J. Candán

Box 4. Five reasons to protect the corridor

The unprotected corridor that separates *Holderness Offshore* and *Holderness Inshore* hosts many species and habitats of conservation interest – including features that were the basis for designating the two MCZs. Here are five key reasons for protecting this corridor, and thereby making marine protection in Holderness more effective:

1. Protected species: *Arctica islandica*, *Phocoena phocoena*, *Halichoerus grypus*.
2. Priority commercial species: *Gadus morhua*, *Molva molva*.
3. Protected habitats: Reefs, *Fragile sponge and anthozoan communities on subtidal rocky habitats*.
4. Priority habitats: *Subtidal sand, Subtidal coarse sediment and Subtidal mixed sediments*.
5. Artificial reef: The wreck of the *SS Longbenton*, a local biodiversity hotspot that is full of life.



Ling (*Molva molva*) sheltered under a rock
© OCEANA /Juan Cuetos

Dahlia anemone (*Urticina felina*)
© OCEANA / Juan Cuetos





© OCEANA Juan Cuetos

PROPOSAL FOR PROTECTION

The sea around Holderness is clearly a hotspot of marine life. A rich diversity of benthic species is found in the area, reflecting the mosaic of substrates that comprise the seabed and, in turn, the habitats that they provide. Holderness is home to an array of species and habitats that are priorities for conservation, and also encompasses essential habitats (e.g., spawning and nursery grounds) for commercially fished species of crustaceans and fishes.

The high ecological value of the seabed has been one of the main reasons underlying the designation of MPAs in the Holderness area. *Flamborough Head*, *Holderness Inshore*, and *Holderness Offshore* were established to protect an array of features of conservation interest, of which some are unique to individual sites, while others are shared among the three MPAs.

In the case of *Holderness Inshore* and *Holderness Offshore*, three of the protected habitat features are common to both areas (i.e., *Subtidal coarse sediment*, *Subtidal mixed sediments*, and *Subtidal sand*), emphasising the broad continuity of the areas protected by the two sites.

However, despite the recognised value of these habitats – and the species that they support – the corridor that lies between *Holderness Offshore* and *Holderness Inshore* remains unprotected. Oceana’s research in Holderness has highlighted the biodiversity value of this unprotected zone (Box 4). The corridor is home to a range of features of conservation interest, including species which the UK has committed to restoring to good condition (e.g., ocean quahog), habitats that are recognised priorities for protection (e.g., *Reefs* and *Fragile sponge and anthozoan communities on subtidal rocky habitats*), and the same three habitat types for which both *Holderness Inshore* and *Holderness Offshore* were designated (see above).

Oceana proposes that *Holderness Inshore* and *Holderness Offshore* be adjoined, to create a single continuous MPA. The two existing MCZs areas represent part of the same ecological system, which is characterised by a variety of sediment types and supports diverse marine communities. Leaving an unprotected corridor that cuts between these sites is likely to limit their effectiveness in protecting the features for which they have been designated, including by weakening ecological connections between the inshore and offshore areas. Adjoining these sites would also simplify management and enforcement of the MPAs, thereby helping to improve the effectiveness of conservation and management measures in this ecologically valuable area.



Tunicate colony (*Clavelina lepadiformis*) © OCEANA / Juan Cuetos

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Dead man's fingers (*Alcyonium digitatum*) © OCEANA / Juan Cuetos

ANNEX: IDENTIFIED ANIMAL SPECIES

Species	Flamborough Head	Holderness Inshore	Holderness Offshore	Corridor	Wreck (inside corridor)
Annelida					
<i>Lanice conchilega</i>		X	X		
<i>Sabella</i> sp.			X		
Sabellidae			X		
<i>Salmacina dysteri</i>				X	
<i>Spirobranchus triqueter</i>		X	X	X	
<i>Spirorbis (Spirorbis) spirorbis</i>				X	
Arthropoda					
Balanomorpha			X	X	
<i>Balanus</i> sp.			X	X	
<i>Balanus balanus</i>			X	X	
<i>Balanus</i> cf. <i>crenatus</i>					X
<i>Balanus crenatus</i>		X	X	X	
<i>Byblis gaimardii</i>			X		
<i>Cancer pagurus</i>		X	X	X	
<i>Caprella linearis</i>		X		X	X
Caridea			X	X	
<i>Ebalia cranchii</i>				X	
<i>Ebalia tuberosa</i>			X		
<i>Ebalia tumefacta</i>			X	X	
Euphausiacea				X	
<i>Eurynome aspera</i>			X		
<i>Galathea</i> sp.			X	X	
<i>Galathea intermedia</i>		X	X	X	
<i>Galathea squamifera</i>			X	X	
<i>Galathea strigosa</i>			X	X	
Galatheaidea			X	X	
<i>Homarus gammarus</i>		X	X	X	X
<i>Inachus</i> sp.				X	
<i>Inachus dorsettensis</i>		X		X	
<i>Inachus phalangium</i>		X			
<i>Lphimedia obesa</i>			X		
<i>Liocarcinus</i> sp.				X	
<i>Liocarcinus depurator</i>				X	
<i>Liocarcinus holsatus</i>			X	X	
<i>Liocarcinus marmoreus</i>				X	
<i>Macropodia</i> sp.			X		
<i>Macropodia rostrata</i>			X	X	
<i>Munida</i> sp.			X	X	
<i>Munida intermedia</i>			X	X	
<i>Munida rugosa</i>			X	X	
<i>Munida sarsi</i>			X		
<i>Necora puber</i>		X	X	X	
<i>Nymphon gracile</i>			X		

Species	Flamborough Head	Holderness Inshore	Holderness Offshore	Corridor	Wreck (inside corridor)
<i>Orchestia gammarellus</i>		X			
<i>Pagurus bernhardus</i>			X	X	
<i>Pandalina brevirostris</i>			X	X	
<i>Pandalina profunda</i>		X	X	X	
<i>Pandalus montagui</i>			X	X	
<i>Pilumnus hirtellus</i>			X		
<i>Pisidia longicornis</i>		X	X	X	
<i>Semibalanus balanoides</i>		X	X	X	
<i>Sessilia</i> sp.			X	X	
Brachiopoda					
<i>Novocrania anomala</i>			X		
Bryozoa					
<i>Aetea anguina</i>				X	
<i>Alcyonidium</i> sp.				X	
<i>Alcyonidium diaphanum</i>	X	X	X	X	
<i>Alcyonidium parasiticum</i>				X	
<i>Bryozoa</i>		X	X	X	
<i>Bugula</i> sp.				X	
<i>Bugulina flabellata</i>		X	X	X	
<i>Callopora</i> sp.				X	
<i>Cellaria</i> sp.				X	
<i>Cellaria fistulosa</i>			X	X	
<i>Cellepora pumicosa</i>		X	X	X	
<i>Conopeum reticulum</i>		X	X		
<i>Crisia</i> sp.		X		X	
<i>Crisia eburnea</i>		X	X	X	
<i>Crisularia plumosa</i>			X	X	
<i>Electra</i> sp.				X	
<i>Electra pilosa</i>				X	
<i>Flustra foliacea</i>		X	X	X	X
<i>Reptadeonella violacea</i>			X		
<i>Schizomavella</i> sp.				X	
<i>Schizomavella</i> (<i>Schizomavella</i>) <i>linearis</i>			X	X	
<i>Schizomavella</i> (<i>Schizomavella</i>) <i>mamillata</i>		X			
<i>Schizoporella</i> sp.			X		
<i>Schizoporella unicornis</i>		X	X		
<i>Scrupocellaria</i> sp.		X	X	X	
<i>Securiflustra securifrons</i>			X	X	
<i>Tubulipora</i> sp.				X	
Chordata					
<i>Aplidium glabrum</i>				X	
Ascidacea			X	X	
<i>Ascidella aspersa</i>				X	
<i>Botrylloides</i> sp.			X	X	

Species	Flamborough Head	Holderness Inshore	Holderness Offshore	Corridor	Wreck (inside corridor)
<i>Botryllus schlosseri</i>		X			
<i>Callionymus</i> sp.			X	X	
<i>Callionymus lyra</i>			X	X	
<i>Callionymus reticulatus</i>		X	X		
<i>Chirolophis ascanii</i>			X		
<i>Clavelina lepadiformis</i>		X		X	
<i>Corella eumyota</i>				X	
<i>Ctenolabrus rupestris</i>			X	X	X
<i>Dendrodoa grossularia</i>		X		X	
Gadidae			X	X	
<i>Gadus morhua</i>				X	X
<i>Halichoerus grypus</i>				X	
Labridae			X		
<i>Labrus bergylta</i>			X		X
<i>Limanda limanda</i>			X	X	
<i>Molgula</i> sp.		X			
<i>Molva molva</i>				X	
<i>Phocoena phocoena</i>					X
<i>Pholis gunnellus</i>		X	X	X	
<i>Platichthys flesus</i>			X		
Pleuronectidae			X		
<i>Pollachius pollachius</i>				X	X
<i>Scyliorhinus</i> sp.			X	X	
<i>Scyliorhinus canicula</i>		X	X		
<i>Symphodus melops</i>					X
<i>Taurulus bubalis</i>		X			
<i>Thorogobius ephippiatus</i>					X
<i>Trisopterus esmarkii</i>					X
<i>Trisopterus luscus</i>					X
Cnidaria					
<i>Abietinaria abietina</i>			X	X	
<i>Actinothoe sphyrodeta</i>					X
<i>Aglaophenia</i> sp.		X		X	
<i>Aglaophenia pluma</i>		X		X	
<i>Aglaophenia tubulifera</i>				X	
<i>Aiptasia mutabilis</i>					X
<i>Alcyonium digitatum</i>			X		X
<i>Aurelia aurita</i>					X
<i>Clytia</i> sp.			X		
<i>Cyanea lamarckii</i>			X		
<i>Diphasia</i> sp.				X	
<i>Diphasia margareta</i>				X	
<i>Aurelia aurita</i>					X
<i>Clytia</i> sp.			X		

Species	Flamborough Head	Holderness Inshore	Holderness Offshore	Corridor	Wreck (inside corridor)
<i>Cyanea lamarckii</i>			X		
<i>Diphasia</i> sp.				X	
<i>Diphasia margareta</i>				X	
<i>Dynamena pumila</i>				X	
<i>Ectopleura larynx</i>		X	X		
<i>Halecium halecinum</i>			X	X	
<i>Hydractinia echinata</i>				X	
<i>Hydrallmania falcata</i>		X	X		
Hydrozoa		X	X	X	
<i>Kirchenpaueria pinnata</i>				X	
<i>Lafoea dumosa</i>			X	X	
<i>Metridium senile</i>					X
<i>Nemertesia antennina</i>		X	X	X	X
<i>Nemertesia ramosa</i>			X		
cf. <i>Phymanthus pulcher</i>					X
<i>Rhizocaulus verticillatus</i>		X	X	X	
<i>Sagartia ornata</i>					X
<i>Sagartia troglodytes</i>					X
<i>Sertularella</i> sp.		X		X	
<i>Sertularia argentea</i>			X		
Sertulariidae			X		
<i>Thuiaria thuja</i>			X		
<i>Tubularia indivisa</i>		X	X	X	X
<i>Urticina eques</i>				X	
<i>Urticina felina</i>		X	X	X	
Ctenophora					
<i>Beroe ovata</i>			X		
Echinodermata					
<i>Asterias rubens</i>			X	X	
<i>Crossaster papposus</i>				X	
<i>Echinocyamus pusillus</i>			X		
<i>Echinus esculentus</i>			X	X	X
<i>Henricia</i> sp.			X	X	
<i>Henricia oculata</i>			X		
<i>Henricia sanguinolenta</i>		X	X	X	
<i>Ophiothrix fragilis</i>		X	X	X	
<i>Ophiura</i> sp.				X	
<i>Ophiura albida</i>			X	X	
<i>Ophiura ophiura</i>				X	
Mollusca					
<i>Abra alba</i>		X	X	X	
<i>Abra profundorum</i>			X		
<i>Aequipecten opercularis</i>		X	X	X	
<i>Anomia ephippium</i>		X	X	X	

Species	Flamborough Head	Holderness Inshore	Holderness Offshore	Corridor	Wreck (inside corridor)
<i>Aplysia punctata</i>		X			
<i>Arcopagia crassa</i>			X		
<i>Arctica islandica</i>			X	X	
<i>Boreotrophon</i> sp.				X	
<i>Boreotrophon clathratus</i>		X			
<i>Boreotrophon truncatus</i>			X	X	
<i>Cadlina laevis</i>		X		X	
Caenogastropoda				X	
<i>Calliostoma zizyphinum</i>			X	X	
Cardiidae				X	
<i>Cerastoderma glaucum</i>				X	
<i>Chamelea striatula</i>				X	
<i>Chiton olivaceus</i>		X			
<i>Clausinella fasciata</i>			X		
<i>Corbula gibba</i>			X		
<i>Doridina</i> sp.			X		
<i>Dosinia lupinus</i>			X		
<i>Edmundsella pedata</i>		X			
<i>Ensis</i> sp.		X	X		
<i>Euspira nitida</i>		X			
<i>Fabulina fabula</i>		X		X	
<i>Fjordia browni</i>				X	
<i>Gari</i> sp.			X		
<i>Gari depressa</i>			X		
<i>Gari fervensis</i>		X	X		
Gastropoda			X		
<i>Gouldia minima</i>			X		
<i>Hemilepton nitidum</i>				X	
<i>Heteranomia squamula</i>		X	X	X	
<i>Hiatella rugosa</i>		X	X	X	
<i>Hydrobia</i> sp.				X	
<i>Iothia fulva</i>		X			
<i>Janolus cristatus</i>			X	X	
<i>Lepidochitona cinerea</i>			X		
<i>Leptochiton asellus</i>		X	X	X	
<i>Mimachlamys varia</i>		X	X	X	
<i>Modiolus modiolus</i>			X		
<i>Mya arenaria</i>		X			
<i>Mya truncata</i>				X	
<i>Mytilus edulis</i>		X		X	
<i>Nassarius</i> sp.			X	X	
<i>Nucula nitidosa</i>		X	X	X	
<i>Nuculana pernula</i>		X	X	X	
Nudibranchia			X	X	
<i>Ocenebra erinaceus</i>		X			

Species	Flamborough Head	Holderness Inshore	Holderness Offshore	Corridor	Wreck (inside corridor)
<i>Palliolum</i> sp.			X		
<i>Palliolum incomparabile</i>			X		
<i>Palliolum striatum</i>				X	
<i>Palliolum tigerinum</i>				X	
<i>Panomya norvegica</i>		X	X	X	
<i>Parvicardium pinnulatum</i>		X	X	X	
<i>Patella</i> sp.				X	
<i>Patella vulgata</i>			X		
<i>Pecten maximus</i>			X		
Pectinidae				X	
Pholadidae				X	
<i>Pholas</i> sp.					X
<i>Pholas dactylus</i>			X		
<i>Pododesmus</i> sp.		X		X	
<i>Pododesmus patelliformis</i>		X	X	X	
<i>Polititapes rhomboides</i>				X	
<i>Sphenia binghami</i>				X	
<i>Spisula elliptica</i>		X	X	X	
<i>Steromphala cineraria</i>		X	X	X	
<i>Talochlamys pusio</i>			X	X	
<i>Tectura virginea</i>			X		
<i>Thracia gracilis</i>		X			
<i>Timoclea ovata</i>			X	X	
<i>Tritia</i> sp.				X	
<i>Tritia reticulata</i>			X		
<i>Trivia</i> sp.				X	
<i>Venus casina</i>			X	X	
<i>Venus verrucosa</i>			X		
Porifera					
cf. <i>Antho coriacea</i>					X
cf. <i>Axinella</i> sp.		X			
<i>Cliona celata</i>			X		
<i>Dysidea fragilis</i>		X	X	X	
<i>Halichondria</i> (<i>Halichondria</i>) <i>panicea</i>				X	X
cf. <i>Haliclona</i> sp.		X			
cf. <i>Haliclona xena</i>					X
<i>Hemimyscale columella</i>		X			X
<i>Hymedesmia</i> (<i>Stylopus</i>) <i>coriacea</i>					X
<i>Leucosolenia variabilis</i>		X		X	
<i>Myxilla</i> (<i>Myxilla</i>) <i>rosacea</i>		X			X
<i>Polymastia</i> sp.			X	X	
Porifera			X	X	
<i>Suberites massa</i>		X			
<i>Sycon ciliatum</i>		X		X	

PROTECTING THE NORTH SEA: HOLDERNESS

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