

3.12 Marine

The seabed around England is composed of a rich variety of substrata ranging from the rocky granite reefs around Cornwall to mobile sandbanks off North Norfolk. It is this variety of seabed type, coupled with the influence of both colder Arctic and warmer Mediterranean waters around our shores, that results in the diverse range of marine species and habitats.

In the north-east, the seabed tends to slope away uniformly from the coast to a depth of about 60 m, with the exception of the Farne Deep trench, which is over 100 m deep. Water temperatures in this region are some of the coldest in the UK. Sand and gravel covers much of the offshore seabed. However, there are outcrops of bedrock along the Northumberland coast and around the Farne Islands. This area sits within the Boreal biogeographic region and its wildlife is influenced by water flowing into the North Sea off the east coast of Scotland. This cool current brings with it the larvae of species that occur along the east coast of Scotland and the island groups of Orkney and Shetland to the north. The contrast in sea surface temperatures from winter to summer contributes to the diverse and unusual range of species present, with some species reaching their northernmost biogeographical extent in this area.

To the south, in the southern North Sea, conditions reflect the movement of warmer water through the Dover Strait from the English Channel. The seabed here is largely composed of sand (often highly mobile) and mixed sand and gravel sediments, with water depths sometimes no more than 20 m. Areas off the Norfolk coast and in the outer Thames are characterised by extensive series of sandbanks and tidal sand ridges.

Further around the coast in the eastern English Channel there is a transition between Atlantic and North Sea influences. This occurs in conjunction with a transition from hard substrates to soft substrates. Water depths vary from between 30 m in the east to over 100 m in the west. Much of the seabed here is composed of mixed sand and gravel sediments, particularly to the south and west of the Isle of Wight. Areas of chalk substrate are also present within the area (particularly south of the Isle of Wight); these are of national and international importance.

Relationship between coastal and marine sections

Although this report contains separate sections on coastal and marine habitats, they are really two parts of the maritime environment. The maritime environment functions as a whole ecosystem with transitions to, and connections and overlaps with, terrestrial and freshwater habitats. For the purposes of this report, the marine environment refers to all areas seaward of the mean low water mark (including subtidal channels of estuaries) out to the limit of territorial waters (generally 12 nautical miles).

UK BAP priority marine habitats in England:

- Blue mussel beds
- Estuarine rocky habitats
- Fragile sponge and anthozoan communities on subtidal rocky habitats
- Horse mussel beds
- Maerl beds
- Mud habitats in deep water
- Peat and clay exposures
- *Sabellaria alveolata* reefs
- *Sabellaria spinulosa* reefs
- Seagrass beds
- Sheltered muddy gravels
- Subtidal chalk
- Subtidal sands and gravels
- Tide-swept channels

To the west, the marine conditions of the western English Channel are influenced by the meeting of warmer and colder water which, together with the varied geology in the area, produces a diverse marine community. Water temperatures here are some of the highest experienced in the UK. Water depths in this area range from 50 m to 120 m. The near-shore seabed is composed of an assortment of mixed sediments (especially gravel and shells) with sand and, in sheltered locations, mud. There are also occasional and sometimes extensive exposures of bedrock and boulder reefs, often occurring off headlands, particularly around south Devon and Cornwall. Of particular note are spectacular rocks and reefs, many of which rise steeply from the deep seabed to within a few metres of the surface. Many species in this region are considered to be at the edge of their range and more normally associated with warmer Mediterranean waters. Turtles and some exotic fish species are occasionally reported.

Much further around the coast in the Irish Sea, the seabed is covered by mobile sediments, ranging from the well-defined muddy-sand belt off the south-west Cumbrian coast, to the large areas of gravel-sand substrata, which cover much of the seabed. The water depth in this area seldom exceeds 60 m, though localised areas of deep water do occur. While the colder water in this region attracts species of colder water origin, it also limits the migration of warmer water species into the area.

3.12.1 Importance of England's marine habitats

Some of England's marine habitats are of European importance and four types are listed in Annex I to the EC Habitats Directive. Our large shallow inlets and bays include rias (river valleys 'drowned' by rising sea levels) in south-west England, which occur only in the British Isles, France and northern Spain (McLeod *et al.* 2005). Chalk reefs are more abundant in England than anywhere else in Europe, as are sea caves in chalk (McLeod *et al.* 2005). The great diversity of animals and plants that live on or in our sea floor is amongst the highest in Europe (Defra 2005a).

Plankton

Plankton are the free-floating microscopic plants and animals that form the base of the marine food chain, and thus provide the foundation for most other marine species. There are considerable spatial differences in the plankton diversity around the seas of England due to its location at the junction between warm temperate and Boreal (cold water) faunas. For example, the composition of the planktonic community in the northern North Sea is more seasonally variable than the southern North Sea because Boreal and warmer oceanic waters carry diverse oceanic and shelf edge communities into the area.

These patterns highlight that temperature and oceanic processes play a key role in the distribution of marine plankton, and the latter can be used as indicators of climate change. Patterns associated with climate change have already been observed around UK waters with movement of warm water and cold water plankton, and shifts in growing seasons. The diversity and abundance of fish (and therefore seabirds and marine mammals) is highly dependent on patterns of growth, composition and abundance of the plankton.

Sources: Covey & Laffoley (2002); Defra (2005c)



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3.12.1.1 Marine species

The seas around the British Isles provide habitat for over 10,000 species (Hiscock 1996). There are few flowering plants (for example eelgrasses *Zostera* species) but over 800 species of algae. Below approximately 25 m depth, there is insufficient light for any plants and the animals take over. More than twice the number of major animal groups (phyla) is found in England's seas than on the land.

The economic value of grey seals in South West England

In South West England, grey seals *Halichoerus grypus* impose costs on the fishing industry by biting fish caught in fishing nets, making them unmarketable. The fishing industry in turn is 'costly' to the seals because about 80 of the South West's population of 400 grey seals are thought to be killed as by-catch in fishing nets per year.

Visitors to the National Seal Sanctuary in Cornwall, and people who had been on seal viewing boat trips in the South West, might be willing to pay a voluntary donation (on average £2.63) towards seal conservation. If all visitors to the National Seal Sanctuary made this average donation, this would generate £526,000 per year, which exceeds the estimated £100,000 per year costs that the seals cause to the fishing industry. Such donations could potentially be used to fund work to reduce both seal by-catch and the damage caused by seals to fish in nets. More of the economic value people place on seals could be captured by the South West's economy if more boat trips provided facilities for young children. Training and accreditation of boat trip operators by the 'Wildlife Safe' programme would minimise any potential disturbance to the seals.

Source: Bosetti & Pearce (2003)

Birds

England's seas provide food for some of the most important breeding seabird populations and non-breeding waterbird and seabird congregations on Earth. This includes breeding populations of seven species of gulls, five of terns, four of auks, fulmar *Fulmarus glacialis*, Manx shearwater *Puffinus puffinus*, European storm-petrel *Hydrobates pelagicus*, gannet *Morus bassanus*, cormorant *Phalacrocorax carbo* and shag *P. aristotelis*. In winter, our seas also support internationally important numbers of divers, grebes and seaducks.

Marine mammals

There are 20 cetaceans listed as priority species the UK BAP. The commonest in English waters are the harbour porpoise *Phocoena phocoena* and bottle-nosed dolphin *Tursiops truncatus* (both listed in Annex II to the EC Habitats Directive). Harbour porpoises occur throughout our coastal waters, particularly off south-west England and the Northumberland coast. Bottle-nosed dolphins are also widely distributed, especially off south and south-west England. The most frequent species of baleen whale is the minke whale *Balaenoptera acutorostrata*. It occurs regularly off the coast of south-west England, and is seen occasionally along the Northumberland coast and offshore from Flamborough Head, mainly between June and September, which may be related to the plankton frontal system in this area. Other species, including long-finned pilot whale *Globicephala melaena*, common *Delphinus delphis*, white-beaked *Lagenorhynchus albirostris* and Atlantic white-sided dolphins *L. acutus* and killer whale *Orcinus orca*, are only found infrequently in near-shore English waters.

Two species of seal regularly occur in English waters, the grey seal *Halichoerus grypus* and the common seal *Phoca vitulina* (both listed in Annex II to the EC Habitats Directive). Grey seals can be seen regularly throughout the North Sea, south-west England and the Irish Sea (typically in the near-shore zone). Approximately 3,600 individuals (or 75% of England's grey seal population) are present off the Northumberland Coast during the breeding season (Duck 1995). A large breeding colony of common seals is found in the southern North Sea, particularly in the Wash and around the North Norfolk coast.

Fish

More than 330 species of fish have been recorded from the continental shelf (less than 200 m depth) surrounding the British Isles. The influence of cold northern waters and warmer waters from the south affects the distribution of marine fish around England. Species diversity is highest in the south west and lowest in the southern North Sea (Defra 2005d). The following description of the main fish assemblages in England's marine waters is summarised from a report (Defra 2005d) produced to support *Charting Progress - An Integrated Assessment of the State of the UK Seas* (Defra 2005a).

In the North Sea and the eastern English Channel, commercial fish populations are dominated by haddock *Melanogrammus aeglefinus* and the following UK BAP priority species: whiting *Merlangius merlangus*, mackerel *Scomber scombrus*, herring *Clupea harengus*, plaice *Pleuronectes platessa* and sole *Solea solea*. Sand-eels (including the UK BAP priority species Raitt's sandeel *Ammodytes marinus*) are abundant and these are important prey for many other fish, marine mammals and seabirds. Short-snouted *Hippocampus hippocampus* and long-snouted *H. guttulatus* seahorses are also priority species in the UK BAP. They breed in shallow coastal waters with seagrass beds, macro-algae and rocky areas off the south and south-west coasts during spring and summer, and then retreat to the relative stability of deeper waters in winter.

The western English Channel, Celtic Sea and Bristol Channel support south-western species, and warm temperate and sub-tropical species sometimes occur. The fish fauna of this area includes the following UK BAP priority species: Angler *Lophius piscatorius*, blue shark *Prionace glauca*, porbeagle *Lamna nasus*, hake *Merluccius merluccius*, common skate *Dipturus batis*, basking shark *Cetorhinus maximus* (see box) and, in the Bristol Channel, shad *Alosa* species and lampreys *Lampetra* and *Petromyzon* species which migrate up some of the rivers.

Basking shark

The basking shark *Cetorhinus maximus* is the second largest fish in the world. It can attain lengths of 12 m and weigh up to 7 tonnes. Basking sharks feed on zooplankton, which they strain from the surface waters of the seas. Comb-like appendages on the gills, called gill-rakers, act to filter out the plankton as water passes through the cavernous mouth and over the gills. The volume of an Olympic-sized swimming pool can be processed in just one hour.

Basking sharks are commonly seen in English waters from early summer along the south coast and south-west peninsula. They appear to follow the oceanic front systems which concentrate plankton in particular areas. These planktonic pulses (blooms) move northwards as the summer progresses and the seas warm in response. In recent years, sightings indicate that basking sharks are moving northwards in greater numbers. This may be linked to prey species shifting northwards in response to global climate change.

These large fish were believed to be seasonal visitors to English waters but recent satellite tagging has revealed that basking sharks are present around the coasts of England all year. In the winter months they follow the zooplankton to greater depths and are not seen at the surface until the following spring.

Source: Sims *et al.* (2005); Southall *et al.* (2005).



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Turtles

English waters are considered to be part of the natural ranges of leatherback *Dermochelys coriacea* and loggerhead turtles *Caretta caretta*. Leatherback turtles are found off English coasts in summer and early autumn. Recent evidence indicates they select areas where jellyfish aggregations appear seasonally. Other marine turtles are sometimes found in our waters but these are usually 'cold-stunned' animals outside their normal range. Sightings often arise through chance encounters or following strandings. We do not fully understand the significance of turtles in English waters in terms of overall breeding populations, which are critically endangered.

Invertebrates

The invertebrate communities of our seas are extremely diverse and include groups that are almost entirely restricted to the marine environment, such as sponges, hydroids (sea-firs), sea anemones, bryozoans (sea-mats), echinoderms (sea urchins, starfish and their relatives) and ascidians (sea-squirts). There are 13 UK BAP priority species and many of them, such as the sunset cup coral *Leptopsammia pruvoti*, pink sea fan *Eunicella verrucosa* (see box) and spiny lobster *Palinurus elephas*, are associated with the rocky reefs around our south and south-west coasts. The tall sea pen *Funiculina quadrangularis* is found on areas of muddy seabed in the north-west, whilst the native oyster *Ostrea edulis* occurs in shallow coastal water habitats, mostly along the south coast. The gooseneck barnacle *Mitella pollicipes* is an oceanic species that arrives on our shores, often attached to driftwood.

Marine algae

England's marine algal flora includes six UK BAP priority species. Notable amongst these are the common maerl *Phymatolithon calcareum* and coral maerl *Lithothamnion corallioides*, which can form extensive beds on coarse sediments in the rias and estuaries of south-west England. They provide an important habitat for marine invertebrates and fish.

Pink sea fan

The pink sea fan *Eunicella verrucosa* occurs from the eastern Mediterranean to south-west Britain. Sea fans are a type of horny coral that catch suspended food using the anemone-like polyps along their branches, which face into the prevailing current. They usually live at depths of 15 m or more.

Sea fans provide a home for the nationally rare sea-fan anemone *Amphianthus dohrnii*, as well as being a source of food for the sea slug *Tritonia nilsodhneri* and the 'poached egg shell' *Simnia patula*, which are both camouflaged to resemble the sea fan. The highest densities of pink sea fans in the UK occur off Plymouth and the Lizard where there may be up to 20 per square metre.

The pink sea fan receives special protection by virtue of being listed in Schedule 5 to the Wildlife and Countryside Act 1981. However, sea fans have suffered damage from fishing operations, such as scallop dredging in Lyme Bay, and are also vulnerable to the effects of nutrient enrichment, disease and climate change.

Source: Hiscock et al. (2005)



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3.12.2 Extent of habitats

Providing a comprehensive assessment of the area of marine habitats around the coast of England is not possible. This is because the relatively few existing surveys are restricted to a few areas. A broad picture of marine habitats has emerged following a two-year project to produce a new map of the sea that shows 44 large-scale 'undersea landscapes' (Figure 3.28). This 'UKSeaMap' project (Connor *et al.* 2006) has identified that undersea landscapes contain the equivalent of mountains, valleys and plains, together with major habitat types.

Based on the UKSeaMap data, there are almost 5 million ha of undersea landscapes in England's seas, of which the overwhelming majority is coarse (47%) or sandy (32%) substrate (Figure 3.28). Although England's territorial waters comprise a relatively small proportion of the wider UK continental shelf waters, they are more diverse and show finer-scale variation of substrate types, tide stress and physiographical features compared to offshore areas.

3.12.3 Protection

This section only describes the protection afforded by SACs and Marine Nature Reserves (MNR), which both include subtidal habitats, including substantial areas outside of estuaries and other inlets. (Subtidal areas within SSSIs, SPAs and Ramsar sites are reported on in the coastal section: this is because these designations do not currently extend to subtidal areas beyond estuaries.)

Marine SACs (beyond the areas within SSSIs) include 247,000 ha of marine habitat, representing 5% of the marine resource in England (Figure 3.29). Of this, approximately 106,000 ha are coarse or mixed sediments, 60,000 ha are sand or mud, 14,000 ha are rocky, and 46,000 ha consist of coastal physiographic features (such as bays, embayments, estuaries or rias). This largely reflects the nature of the habitat types for which SACs have been selected in England's marine environment (subtidal sandbanks, large shallow inlets and bays, reefs, and sea caves).

Only one Marine Nature Reserve (MNR) has been designated in England, covering an area of 3,065 ha of the shores and sea around Lundy off the north Devon coast. This area overlaps entirely with the Lundy SAC. In 2003, 330 ha of sea on the eastern side of Lundy MNR and SAC were confirmed as England's first statutory No Take Zone (NTZ), to provide enhanced protection for the island's marine wildlife.

Figure 3.28 UKSeaMap – Seabed landscapes in the UK

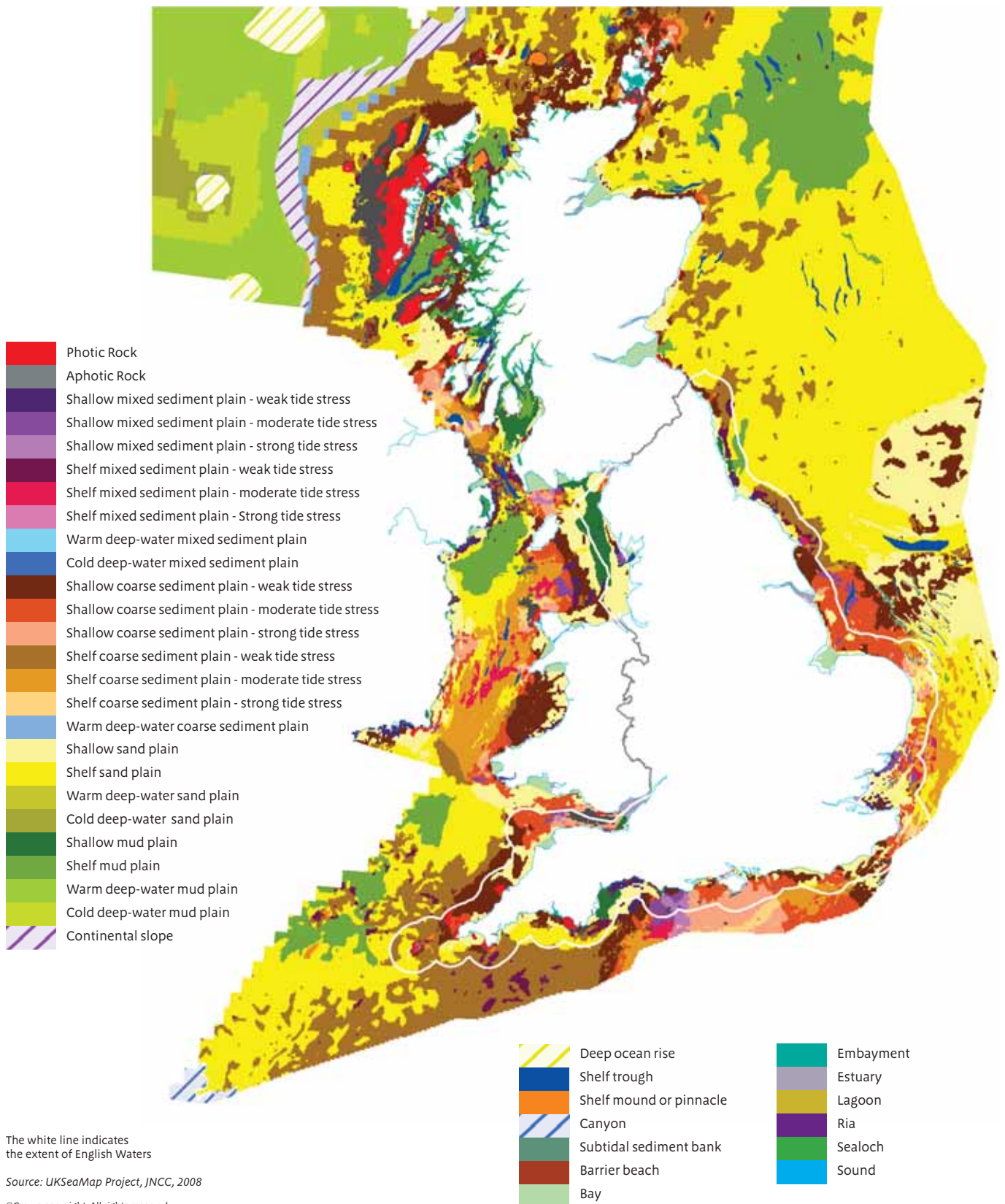
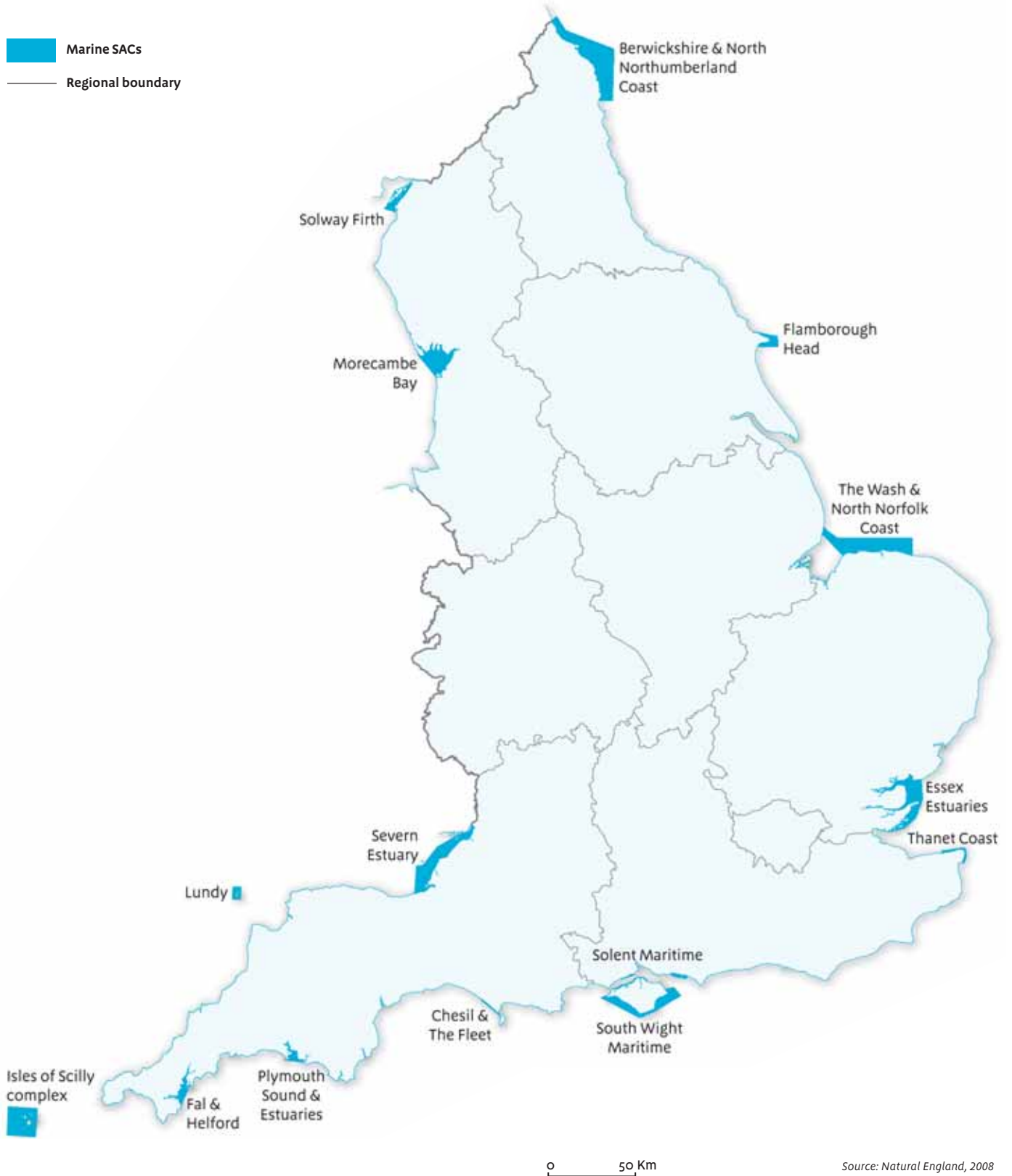


Figure 3.29 Marine SACs outside SSSIs



Source: Natural England, 2008
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Natural England 10006223 2008

3.12.4 Condition

The best available assessment of the UK conservation status of the four Annex I marine habitats for which SACs have been designated in England is provided by JNCC (2007b). It reported that two of the habitats, 'sandbanks which are slightly covered by sea water all the time' and 'large shallow inlets and bays', were unfavourable. The main threats identified were climate change, fishing activity and aggregate extraction. Risk assessments undertaken for the Water Framework Directive identified 22% of UK large shallow inlets and bays as being 'at risk' of failing to meet the standard of Good Environmental Status (Environment Agency 2006b). The conservation status of the remaining two Annex I habitats, 'reefs' and 'submerged or partially submerged sea caves', was not known (JNCC 2007b).

Defra (2005b) identified a wide range of different human activities which have impacts upon the marine environment. These include fishing; marine pollution, including nutrient enrichment and toxic chemicals; extractive uses, such as aggregate dredging and oil and gas extraction; shipping; and invasive non-native species (see Chapter 5).

The Worldwide Fund for Nature's (WWF) marine health check (Hiscock *et al.* 2005) reported on the threats to habitats that have seriously declined over the last 50 years or more:

- Seagrass beds - physical disturbance, invasive non-native species, disease and nutrient enrichment.
- Horse mussel beds - fishing (particularly the use of heavy trawl gear), climate change, coastal development and dredging.
- Maerl beds - commercial extraction, fishing, aquaculture and nutrient enrichment.

In spite of such observations, insufficient knowledge and information continue to hamper full assessments of our seas. This was a particular issue for Defra (2005a) in its first integrated assessment of the UK's seas. It highlighted that information shortfalls were evident, co-ordination was a problem, and indicators and detailed objectives were absent. This was similarly apparent in the 2005 assessment of 14 marine UK BAP priority habitats (BRIG 2006a). The status of nine was unknown and the conclusions for the remaining five were acknowledged to have been largely based on expert judgement, limited by the lack of a systematic surveillance programme.

Valuing people's preferences for sea angling

Recreational sea angling is enjoyed by people of all ages and from all backgrounds. An estimated total of 1.45 million people (5% of households) from all walks of life in England and Wales went sea angling in 2003.

Recreational anglers do not typically pay an access or licence fee to fish in the sea but this does not mean that the activity is not of value to them. A day's fishing had an average value of £26 to a shore angler, £42 to an angler fishing from a charter boat and £104 if they fished from their own boat. Anglers value the experience more highly if they catch bigger fish (they were willing to pay £0.22 for each 1% increase in size in the fish that they caught) and if there is greater diversity of fish (they were willing to pay £8.86 to catch a different type of fish to usual). This highlights the important role of fisheries management in influencing the value to people of a day's angling. In general, the diminished status of many fish stocks is decreasing the number and size of fish that anglers catch.

Sources: Drew Associates (2004)

3.12.4.1 Trends in seabirds

Between 1986 and 2006, the index of seabird populations (which is mostly derived from counts of breeding adults) in England has remained relatively stable (Figure 3.30). Within this overall position, surface feeding species such as Sandwich tern *Sterna sandvicensis* (pictured) and kittiwake *Rissa tridactyla* have declined and continue to do so. These two species are now at 82% and 62% of their baselines, respectively, the lowest numbers on record. Overall, the trend for surface feeding species is at 19% below the 1986 baseline (Defra 2008a).

Trends of sub-surface feeding species such as cormorant, shag and guillemot *Uria aalge* have increased overall by 35% since 1986, largely due to guillemots more than doubling in numbers to 136% above the 1986 baseline (Defra 2008a).

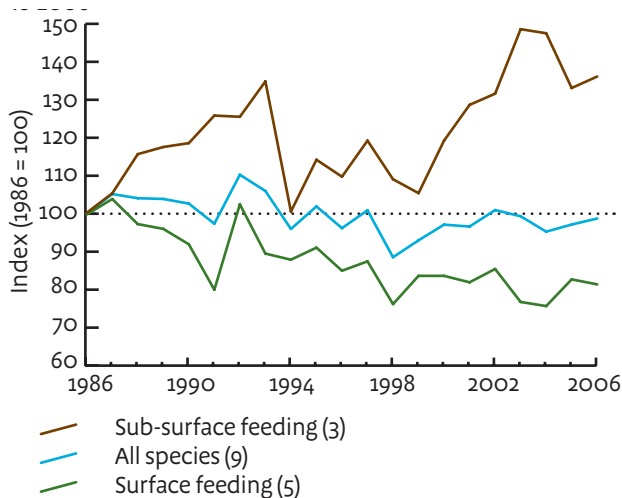
The seabird index may not yet fully reflect the low breeding success rates of some species during recent years, because seabirds take several years to reach maturity. There will therefore be a lag before the results of reduced breeding success manifest themselves as a decline in breeding adults. In most species, poor breeding success is a direct result of food shortages during the breeding season, but it is not yet clear whether over-fishing, climate change, or some combination of both factors is the ultimate cause.

3.12.4.2 BAP marine action plan threats

The main issues posing a threat to marine habitats and species are (BRIG 2006a):

- Habitat loss and degradation from **infrastructure development**, such as coastal defence works, dredging and, to a lesser extent, industrial and port infrastructure.
- **Fisheries practices**, especially damage caused by bottom-trawling fishing gear and dredging for molluscs, fisheries by-catch and over-fishing.
- **Poor water quality** from oil slicks, sewage, sediment, domestic and commercial sources, as well as run-off to estuarine waters from inland agricultural sources (fertilisers and pesticides).
- **Climate change**, including sea level rise and warming waters (affecting species distributions).
- Other pressures, including **human disturbance** (particularly from recreational activities, such as water sports and fishing), may be very significant locally.

Figure 3.30 Population trends of seabirds in England, 1986 to 2006



(Source: BTO, RSPB, JNCC, Defra 2008a)



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