MARINE CONSERVATION SOCIETY

© Jacob Meissner

Threats to the ocean

Sustainability Goals:

Subject links:
Science, Geography

Age: 14-16

Curriculum links:
Climate, Human impact, Changing environment, Land use, Economic activity, Natural resources, Environmental responsibility, UK wildlife, Ecosystems, Group work, Debate

Ocean Literacy Principles:
5. The ocean supports a great diversity of life and ecosystems
6. The ocean and humans are inextricably interconnected

Aim:
Pupils will understand the various threats to the ocean's ecosystems and how these could be reduced through ecosystem- based management and Marine Protected Areas.

Learning Objectives:
- Be able to explain the key threats to the ocean and how these have environmental, economic and social consequences.
- Work in groups to identify how stakeholders can work collaboratively to achieve ecosystem-based management.
- Be able to argue for and against Marine Protected Areas in the ocean through the views of a key stakeholder.

Resources provided:
- Threats to the ocean Fact File
- Threats to the ocean PowerPoint
- Stakeholder cards
- Angel shark threats
- 30x30 Poster
- Marine unProtected Areas Report
- Full curriculum links

Step 1 Background

The ocean covers over 70% of the planet and is home to some of the most colourful, fascinating and beautiful life in the world. The ocean is a vital support system for our planet, playing a major role in the water cycle, providing oxygen, storing carbon, regulating our climate and providing food for millions.

But human activity has threatened the health of our ocean for centuries, and frequently harms the ocean's ability to support us. Fragile habitats have been destroyed, once-common species are now endangered, and marine resources have been exhausted. Our ocean is under threat all around the world, and because the ocean is so vast, we underestimate the devastating impact humans have on it. More information can be found in the Threats to the ocean Fact File.

Step 2 Set the Scene

To set the scene, introduce the importance of the ocean by watching the video, What did the ocean ever do for us?, in the PowerPoint and discuss some of the ways in which the ocean is vitally important.

Resources required: Threats to the ocean PowerPoint

Step 3 Activities

Activity 1 – What are the main threats to the ocean?

Use the slides in the PowerPoint to highlight some of the key threats – notes are provided for each slide to aid you. For each threat, discuss as a class how the threat will affect the ocean environmentally, as well as how communities and industries who rely on the ocean will be affected economically and socially. Create a table on the whiteboard with column headings for environment, economy and society and fill this out as you work your way through the PowerPoint. This will help to highlight how threats to the ocean don't just harm the environment but have many knock on effects.

Resources required: Threats to the ocean PowerPoint

Step 3 Activities

Activity 2 – Ecosystem-based management

Using the PowerPoint, show the video on ecosystem-based management to introduce the need for interconnectivity between industries, communities and the marine environment. Use the PowerPoint and notes provided to introduce the term 'stakeholder'.

Split the class into small groups and hand each group a copy of stakeholder cards. This resource shows a selection of key stakeholders in the marine environment. Allocate a stakeholder to each group. Students should mind map:

- How the actions of their stakeholder could affect the environment.
- The map should then branch out. For each effect, students should consider how they could reduce risk.
- Then for each risk, students should consider what other sectors they could work with to share knowledge and experience and why it makes sense to work with that stakeholder.

For example, in the case of the Ministry of Defence:
- Testing sonar at sea.
- Reducing noise pollution in marine wildlife hotspots.
- Working with environmental charities to understand how noise pollution affects animals, and to discuss which areas of the ocean would cause the least risk to wildlife.

Once students have completed their extended mind maps, they should present their ecosystem-based management ideas to the rest of the stakeholders. Stakeholder groups can then decide whether they should work collaboratively. Keep a note of how many links between stakeholders the students come up with.

Resources required: Threats to the ocean PowerPoint, Stakeholder cards

Activity 3 - Marine Protected Areas

There are several management measures which can help to protect the ocean, such as legislations and laws, restoration projects and Marine Protected Areas (MPAs). As a class, watch the short video within the PowerPoint to introduce students to MPAs.

In the same stakeholder groups as Activity 2, students should be presented with a scenario of the designation of an MPA in their hypothetical local area of the ocean. Stakeholder groups should discuss reasons for or against the designation of an MPA. After 5-10 minutes of group discussions, stakeholders should explain to the rest of the class their views. Other stakeholders can challenge them to create heated discussions.

This activity highlights that though MPAs can have great benefits for marine biodiversity, management is a difficult balance between environmental, economic and social needs.

Resources required: Threats to the ocean PowerPoint

Extension activity ideas

Protecting Angel Sharks

Angel sharks are critically endangered. Using the range decline map and threats grid (in Threats to angel sharks resource) students should create a management plan to ensure better protection for angel sharks.

Resources required: Threats to angel sharks

Greater protection for our ocean

Countries from around the world have signed up to committing to protect 30% of the world's ocean by 2030 to protect and recover biodiversity. Although over 38% of the UK seas have been designated as Marine Protected Areas, marine wildlife is still declining and fragile habitats within these 'protected' areas are still being damaged. More effective management is urgently needed and conservation charities are calling for stricter measures within these areas.

Students should use information provided in the 30x30 Poster and the Marine unProtected Areas report to create a poster that can be used in school and can be shared on social media. The poster should explain why we need to protect 30% of the world's ocean by 2030 and why this protection needs to include some Highly Protected Marine Areas.

Resources required: 30x30 Poster, Marine unProtected Areas report

Step 4 Reflect

Can you explain one of the key threats to the ocean and the environmental, economic and social consequences of this threat? What is a stakeholder? Why is it important for stakeholders to work collaboratively? Why is it important for us to fully protect some areas of the ocean?

Step 5 Follow up

To explore key threats to the ocean in more detail, use our Climate change, Sustainable fishing and Marine pollution resource packs.

Threats to the ocean Fact File

Why do we need to protect the ocean?

The ocean covers over 70% of the planet and is home to some of the most colourful, fascinating and beautiful life in the world. The ocean is a vital support system for our planet, playing a major role in the water cycle, providing oxygen, storing carbon, regulating our climate and providing food for millions.

Human activity has been threatening the health of our ocean for centuries and harming the ocean's ability to support us. One third of the world's population live by the coast, putting enormous pressure on coastal ecosystems. Fragile habitats have been destroyed, once-common species are now endangered, and marine resources have been exhausted.

A healthy reef
© NOAA

Fishing litter
© Bo Eide

Our seas are under threat all around the world, with marine ecosystems some of the most heavily-exploited ecosystems on the planet. Perhaps because the ocean is so vast, we underestimate how our actions can impact it.

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Threats to the ocean Fact File

Threats to our ocean

Marine litter

80% of marine litter comes from sources on land, and our throwaway society is having a harmful effect on marine life.

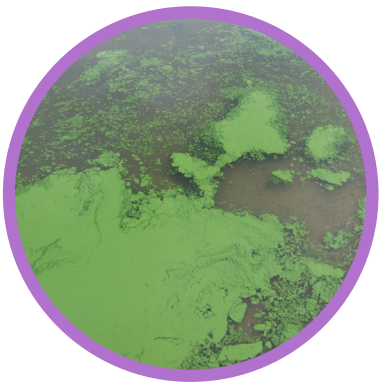
- 60-90% of marine litter is made of plastic items, which can take hundreds of years to break up.
- Animals can become entangled in litter, causing injury, reduced mobility and even death. Ingestion of litter, particularly plastic, is very problematic for marine life who are unable to digest it.
- Consumers and businesses are beginning to change their behaviour to reduce the threat of plastic pollution, but we are still a long way off where we need to be.

Gull with plastic packet
© Ingrid Taylar

Chemical pollution

There are many forms of invisible pollutants causing harm to the ocean.

- Sewage enters the ocean either treated from water treatment plants or untreated from drains.
- Harmful chemicals from factories, industries and even household products are discharged into rivers, finding their way eventually to the ocean.
- Agriculture runoff entering the ocean contains pesticides and other chemicals which can cause algal blooms, reducing oxygen and harming marine life. These toxic chemicals can build up in food chains causing harm to a wide variety of marine life.
- Chemical pollutants can travel in ocean currents and have been found in areas of the ocean miles away from human activity.



Algal bloom
© Dr. Jennifer L. Graham

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Threats to the ocean Fact File

Climate change

Human activities are producing high levels of CO_2 and other greenhouse gases, leading to a change in the earth's climate.

- Marine ecosystems are sensitive to even modest changes to their environment.
- Rising temperatures are causing coral reefs to bleach and die, and are causing species to change their natural migration routes.
- Increasing CO_2 levels are changing the chemistry of the ocean and leading to ocean acidification. This impacts species that have calcium carbonate skeletons, like mussels and lobsters.
- Rising sea levels and increased storms are damaging fragile coastal habitats.

Bleached coral
© ARC Centre of Excellence for Coral Reef Studies

Unsustainable fishing practices

Millions of people all over the world rely on seafood for income and food.

- Unsustainable fishing poses a huge threat to marine biodiversity, impacting food chains and causing depleting fish stocks. 90% of the world's fish stocks are fully or over-exploited.
- Destructive fishing practices like trawling and dredging can badly damage seabed habitats.
- Illegal and unregulated fishing has disastrous effects on the marine environment and harms the livelihood of honest fishers.
- Intensive fish farming causes pollution and depletion of wild caught fish stocks, through their use in fish feed and through farmed fish spreading disease and parasites to wild fish.

Bottom trawler
© ekkaia via Flickr

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Threats to the ocean Fact File

Trafficking of marine life

Species like seahorses, sharks and eels are caught for their value in the traditional medicine market, as seaside souvenirs, and delicacies like shark fin soup.

- Every year, an estimated 150 million seahorses are caught for the souvenir and medicine trades. As a species, seahorses could be extinct by 2050.
- The critically-endangered European eel is at the centre of the largest wildlife crime in Europe, with the illegal trafficking of these fish to Asia becoming a multibillion-euro industry.

Seahorse
© Valkyrie Pierce

Oil and gas

Drilling for oil and gas can pose serious threats to the marine environment, from the construction of platforms, transporting of goods, building pipelines and extremely destructive oil spills.

Oil washing up on a beach after a spill © NOAA

Construction and dredging

In the ocean, construction takes place for the purpose of:

- oil and gas rigs, wind turbines, pipelines, coastal development or the extraction of marine sediments for construction on land.
- All of these activities can cause harm to the marine environment through direct destruction of habitats and noise pollution.

Offshore wind farm
© DECC (UK Gov)

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Threats to the ocean Fact File

Recreation and tourism

60% of the world's population live within 60km of the coast, and many people use beaches and coastal waters for recreation.

- Pressure from recreational development and activities can cause harm to sensitive coastal habitats.
- Activities like pleasure boating can cause harm through oil discharge and damage seabed habitats when anchoring.
- Natural coastal habitats are being destroyed to make room for development. This not only directly reduces biodiversity, but also reduces vital functions these habitats provide, such as helping to protect land from erosion and helping to filter nutrient runoff from the land.

Falmouth, UK
© Tim Green

Shipping

Many of our commercial goods are transported around the world by our shipping industry.

- This industry is associated with causing large amounts of pollution through emissions, oil spills, container spills, dumping of rubbish at sea and chemical pollution through anti-fouling paint.
- Shipping also causes damage through anchoring, shipwrecks, noise pollution, direct contact with large marine mammals and the movement of invasive species in ballast water.

Container ship
© Steven Straiton

MARINE CONSERVATION SOCIETY

Threats to the ocean Fact File

Managing threats to the ocean

Managing activities in the marine environment is important to ensure we protect the future health of the ocean, but it is an incredibly difficult task.

There are many stakeholders who have conflicting opinions on marine management, including governments, commercial industries, large and small-scale fishers, tourist industries, environmental NGOs, the scientific community and coastal residents. The ocean is a vast space and managing activities within it is logistically and financially difficult.

Ecosystem Based Management (EBM)

EBM is an integrated approach to managing the ocean's resources. Rather than considering a single issue, species or ecosystem, this type of management seeks to protect the environment while continuing to support communities and the economy.

It's important that the various users of the sea understand how their interactions with the ocean affect its environment. By better understanding this connection, users can be better prepared to predict risk and work to eliminate harm to the ocean. EBM also focuses on assessing the cumulative impacts on the ocean. Users from various sectors need to work collaboratively with each other to increase knowledge and ensure sustainability of ocean resources.

Legislation, laws and licences

Legislation and laws are in place to reduce threatening activities. Many activities require licences, and marine industries such as dredging and construction have to pass several environmental criteria before being issued with a licence.

Oil rig

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Threats to the ocean Fact File

Managing threats to the ocean (continued)

Marine Protected Areas (MPAs)

MPAs act like nature reserves, protecting specific vulnerable species or whole habitats due to their importance as breeding or feeding grounds. 'MPA' is a catch-all term and there are many different types in the UK, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), Marine Conservation Zones (MCZs) or RAMSARR sites.

MPAs can help to reduce destructive activity and protect and recover biodiversity, but in order for them to work effectively, a network of sites is needed across the UK as marine species are mobile. Many of the designations are merely names, and damaging activities still take place in some of these areas. MPAs need to be better managed and enforced, and we need to increase the number of Highly Protected Marine Areas or No Take Zones, where all damaging activities are banned.

Restoration

Restoration projects aim to actively restore habitats through conservation work, including initiatives such as Project Seagrass in Wales, and the EU LIFE ReMEDIES project in southern England. These projects aim to restore seagrass beds by collecting and cultivating seeds and actively planting them in coastal waters at suitable sites to restore seagrass beds in particular areas.

Inner Sound of Skye, the site of an MPA
© Reading Tom

Seagrass bed
© Benjamin L. Jones

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Fishing Industry

In the fishing industry there are both local small-scale fishers with their own boats and large-scale fishers run by big business. Billions of people all over the world rely on seafood for income and food. In the UK the fishing industry is historically, culturally and economically important.

Some fishing practices like trawling are damaging to marine habitats and overfishing (taking too many fish) can affect the whole marine food chain.

Shipping

Many of our commercial goods are transported around the world by the shipping industry. Shipping alone contributes £10 billion to the UK GDP and supports 240,000 jobs.

This industry is associated with causing pollution through emissions, oil spills, container spills, dumping rubbish at sea, and chemical pollution through anti-fouling paint. Shipping also causes damage through anchoring, shipwrecks, noise pollution, direct contact with large marine mammals, and the movement of invasive species through ballast water.

Renewable Energy

Renewable energy includes energy produced though wind, waves and tides. Offshore wind supplies 9.5% of the UK's electricity production.

Construction of wind turbines can cause noise pollution and direct damage to marine ecosystems. However, once the development of the structures is complete, there is evidence that these structures provide an artificial reef for marine species to attach to, creating a kind of man-made habitat.

Oil & Gas

The ocean provides us with many valuable resources including oil and gas. Oil and gas have many uses, for example to produce electricity, heat homes, fuel vehicles and planes and to create products.

Drilling for oil and gas can pose serious threats to the marine environment, from the construction of platforms, transporting of goods, creating pipelines and through extremely destructive oil spills.

Ministry of Defense

The Ministry of Defence includes, the navy, army and air force, all whose aim is to protect our country. They use the ocean as a training ground to practise exercises, including firing missiles and testing unmanned aerial vehicles.

Testing weapons causes noise pollution and directly litters the marine environment. Boats are also associated with air pollution through emissions.

Tourism

Our beautiful coastline and beaches attract huge numbers of tourists from all over the UK and beyond. In 2019 coastal tourism generated £17.1 billion a year in Great Britain. The number of people who enjoy coastal scenery and activities proves how healthy seas are vital for our health and wellbeing.

Pressure from recreational activities can cause harm to sensitive coastal habitats, for example pleasure boats can cause harm through oil discharge and damage to the seabed habitats through anchoring. On top of this, natural coastal habitats are being destroyed to make room for development associated with tourism.

Environmental Groups

There are many different groups interested in protecting the marine environment, from marine scientists to environmental and wildlife charities.

Some groups might be particularly interested in protecting the ocean because of the environmental services that habitats provide, such as producing oxygen, storing carbon, reducing wave energy, and filtering pollution from the water.

Other environmental groups might focus on protecting the incredible biodiversity of our waters, for example protecting bottlenose dolphins, seabirds, and sharks.

Local Community

Over 5.3 million residents live in coastal towns in England and Wales, and approximately 40% of the Scottish population live in coastal areas. Within the local community there will be many different interests and concerns connected to the local coastline.

Many local livelihoods will depend on the ocean, such as people working in fishing, the oil and gas industry or tourism. Local communities might support development along the coast to bring jobs and money to the local community. However other local citizens might be against development, they might not want their local coastline to change or they might have environmental concerns.

FIGURE 2: Possible threats faced by Angelsharks in the Welsh Zone, identified during the Wales Angelshark Action Plan workshop, organised by IUCN threat categories as classified by Salafsky *et al.* 2008

1 Residential & commercial development	Coastal building and infrastructure development	Extractive Industries (e.g. aggregate, capital, maintenance dredging)						
2 Agriculture & aquaculture	Agriculture run off from land	Marine aquaculture (intertidal & subtidal)						
3 Energy production and mining	Renewable energy (e.g. wind farms, underwater turbines, tidal lagoons) and associated infrastructure	Mining contaminants run off from land	Maritime mining, oil or gas operations					
4 Transportation & service corridors	Pipelines and electrical cables							
5 Biological resource use	Illegal, Unreported & Unregulated (IUU) fishing	Accidental capture and possible incidental mortality in commercial fisheries* operating in the Welsh Zone	Accidental capture and possible incidental mortality in commercial fisheries* operating in the Wider Region	Change in type of commercial fishing vessels operating in the Welsh Zone at the end of the Transition Period	Accidental capture and possible incidental mortality in recreational fisheries** operating in the Welsh Zone	Accidental capture and possible incidental mortality in recreational fisheries** operating in the Wider Region	Mortality through entanglement in lost nets (ghost fishing)	Alteration of food chain (overfishing of prey species)
6 Human intrusion & disturbance	Altered seafloor morphology	Anchor damage of habitats	Impact of beach users / activities on coastal Critical Angelshark Areas					
7 Natural system modifications	Coastal defences along shoreline	Habitat loss at Critical Angelshark Areas	Habitat modification at Critical Angelshark Areas	Habitat loss or modification prevents natural Angelshark movements				
8 Invasive & other problematic species & genes	Low genetic diversity (genetic bottlenecks/ population fragmentation)							
9 Pollution	Water pollution	Micro / macro plastics	Sewage	Oil spills	Eutrophication			
10 Geological events								
11 Climate change & severe weather	Oceanic temperature changes	Sea level rise	Acidification	Oceanographic cycles				

Key:

- First level threats as classified by Salafsky *et al.* 2008
- Considered a high possible threat for Angelsharks in Wales
- Considered a possible threat for Angelsharks in Wales
- * All commercial fishing (Under 10 m's; 10 – 12m's; over 12 m's) registered in any country
- ** All recreational fishing in the Welsh Zone (angling from boat, surfcasting, spearfishing, charter boat fishing)

30X30

Regenerating
Ocean Life

A call to action to protect 30% of the world's ocean by 2030

30x30

Why do we need to protect ocean life?

- **70%** OF THE EARTH IS OCEAN
- **80%** OF ALL LIFE ON EARTH LIVES IN THE OCEAN
- EVERY SECOND BREATH WE TAKE COMES FROM THE OCEAN
- IT IS THE MAIN SOURCE OF FOOD AND JOBS FOR BILLIONS OF PEOPLE ACROSS THE PLANET
- GENERATES US$1.5 TRILLION IN GLOBAL ECONOMIC ACTIVITY OF WHICH US$390 BILLION COMES FROM MARITIME AND TOURISM ACTIVITIES ALONE
- **97%** OF EARTH'S FRESH WATER IS HELD BY THE OCEAN

Without a healthy ocean, we won't have a healthy planet

What is 30x30?

A CALL TO ACTION TO SAFEGUARD AT LEAST 30% OF THE WORLD'S OCEAN BY 2030 THROUGH A NETWORK OF HIGHLY OR FULLY PROTECTED MARINE AREAS WHERE NO DESTRUCTIVE OR EXTRACTIVE ACTIVITIES SUCH AS FISHING OR MINING CAN TAKE PLACE.

- TODAY, JUST OVER 2% OF THE OCEAN IS FULLY PROTECTED

What would protecting 30% of the ocean achieve?

- SAFE HAVENS FOR MORE AND BIGGER FISH + SPECIES DIVERSITY
- HEALTHY AND RESILIENT OCEAN ECOSYSTEMS AND SPECIES THAT CAN BETTER WITHSTAND AND RECOVER FROM CLIMATE IMPACTS
- CLIMATE CHANGE MITIGATION: PROTECTING COASTAL HABITATS THAT SEQUESTER AND STORE CARBON LIKE MANGROVES AND SEAGRASSES (CO_2)
- LIVELIHOODS AND FOOD FOR ALL
- REDUCE OCEAN RISK FROM EXTREME WEATHER EVENTS AND SEA LEVEL RISE THROUGH PROTECTING COASTAL NATURAL DEFENSE SYSTEMS, LIKE REEFS AND MANGROVES
- HIGH FINANCIAL RETURNS – COST OF PROTECTING 30% OF OCEAN = US$223-228 BILLION. FINANCIAL RETURN BY 2050 = US$490 TO $920 BILLION + 150,000 TO 180,000 FULL-TIME JOBS

30% = $

Together, we can make a difference

- Check out the level of strict protection in your country's waters at mpatlas.org's global map. Urge them to do more
- Visit campaignfornature.org and sign their petition for world leaders to support 30x30 in a new global deal for nature
- Sign up to Ocean Unite's Navigator monthly newsletter to keep on top of key ocean issues and how to be a responsible ocean user

oceanunite.org/take-action

- Help Unite the Ocean community around the need for a #Love30x30 vision. Share our film!

www.oceanunite.org/30x30

marine conservation society

MARINE ~~PROTECTED~~ UNPROTECTED AREAS

The UK's seas urgently need better management and protection

More than a third of UK seas are Marine Protected Areas (over 300,000km^2). Like nature reserves and national parks on land, these areas have been set up to protect at-risk species and habitats.

While, on paper, these areas are protected, many continue to be exploited and destroyed. Just 5% of the UK's Marine Protected Areas ban bottom trawling, a method of fishing that can damage the seabed, kill animals and plants and release carbon stored in the seabed.

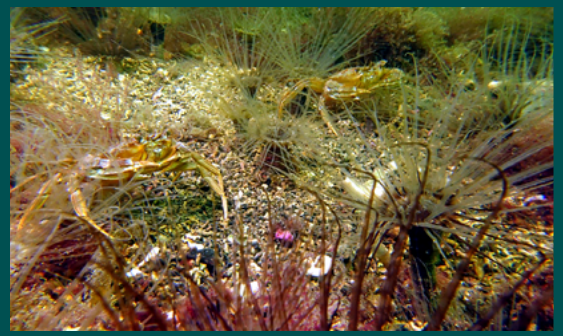
This report, a result of research and analysis conducted by scientists at the Marine Conservation Society, provides an insight into the pressures faced by the UK's seabed and charts a way forward.

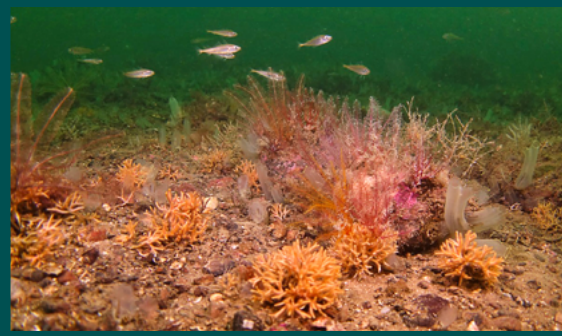
We need an urgent transition towards climate and nature-positive fishing, starting with a ban on bottom trawling in all offshore Marine Protected Areas where the seabed and associated species are meant to be protected. This is to help:

- Restore marine ecosystems
- Sustain the fishing industry and food supply
- Limit climate change

Seabeds devastated by bottom trawl fishing

Real world recovery after bottom trawling banned





Photographic evidence of recovery within the shallow water of South Arran Marine Protected Area. We expect similar seabed recovery in offshore areas in deeper waters. Howard Wood/C.O.A.S.T.

Bottom trawling

Bottom trawling is a method of fishing where heavily weighted nets are dragged across the seabed to sweep up fish and shellfish.

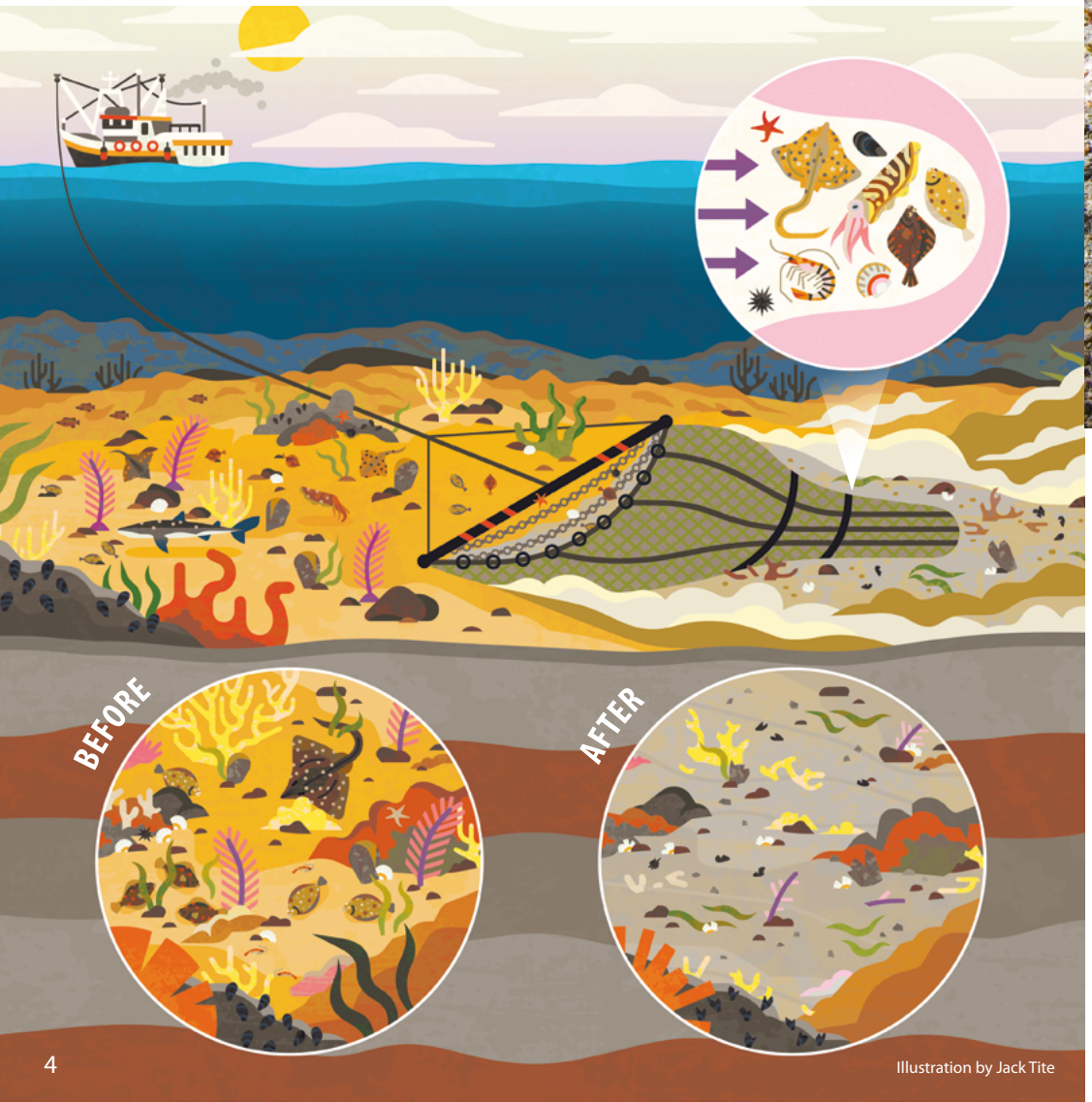


Illustration by Jack Tite

Scallop dredged seabed at Lyme Bay
Colin Munro Photography

Many once-rich seabeds are now comprised of bare sands, shell and gravel. But they **can** recover.

Within five years of protection from bottom trawling, animals in three UK Marine Protected Areas were found to be larger and more diverse.

In fully protected areas studied around the world, biodiversity increased by 21% on average.

While some slow progress is being made to restrict bottom trawling in protected areas close to shore, there is little or no protection for offshore sand, mud and gravel habitats, where most bottom trawlers operate.

Research findings – hours spent fishing

In UK offshore Marine Protected Areas designed to protect the seabed, beyond 12 nautical miles of the coast:

All but one experienced bottom trawling and dredging between 2015 and 2018.

Half experienced at least 1,000 hours of bottom trawling since being protected.

Areas given protection in 2019 experienced the highest fishing rates of all, with this level of fishing likely to continue without proper management.

Bottom trawl and dredge vessels spent at least 89,894 hours fishing the seabed inside Marine Protected Areas between 2015 and 2018.

Colin Munro Photography

Bottom trawling and climate change

Bottom trawling significantly affects our efforts to limit climate change.

93% of the carbon stored in the UK's seafloor is found in muddy and sandy sediments which are mainly offshore, where there are no trawling restrictions. As the seabed is trawled, carbon stored in the seafloor is released into the water, where it may make its way into the atmosphere and contribute to climate change.

The reduction in living seabed habitats from industrial activities such as bottom trawling has compromised the sea's capacity to continue to store carbon. It's estimated that carbon emissions released by bottom trawling across the UK continental shelf between 2016 and 2040 could cost up to £9 billion to mitigate. Banning bottom trawling would not just stop the loss of carbon stores, but also help to build them back up.

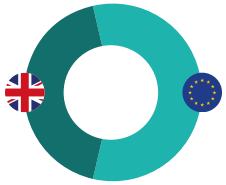
The simplest and most cost-effective restorative approach is to leave the seabed free from disturbance by bottom trawling. It's likely the seabed and the species that rely on it could recover in most Marine Protected Areas, but not if they continue to be trawled.

Dogfish Keith Hiscock

Continued disturbance of carbon stored in the seabed in these sites could cost the UK nearly £1 billion over the next 25 years.

Who is trawling our protected seabed? And where?

UK fishing boats were responsible for 43% of bottom trawling in offshore Marine Protected Areas between 2015 and 2018. The remaining 57% of fishing was conducted by other EU fleets.



The highest Marine Protected Area fishing rates:

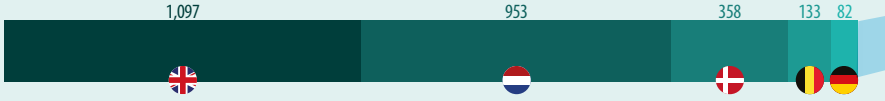
CENTRAL FLADEN (NORTHERN NORTH SEA, EAST OF ORKNEY)
MARGATE AND LONG SANDS (OFF THE KENT COAST)
HAISBOROUGH, HAMMOND AND WINTERTON (OFF THE NORFOLK COAST)

These sites experienced fishing activity across almost all of their surface area. UK, Belgian and Dutch fleets were the dominant vessels operating in these areas, respectively.

CASE STUDY **DOGGER BANK MARINE PROTECTED AREA**

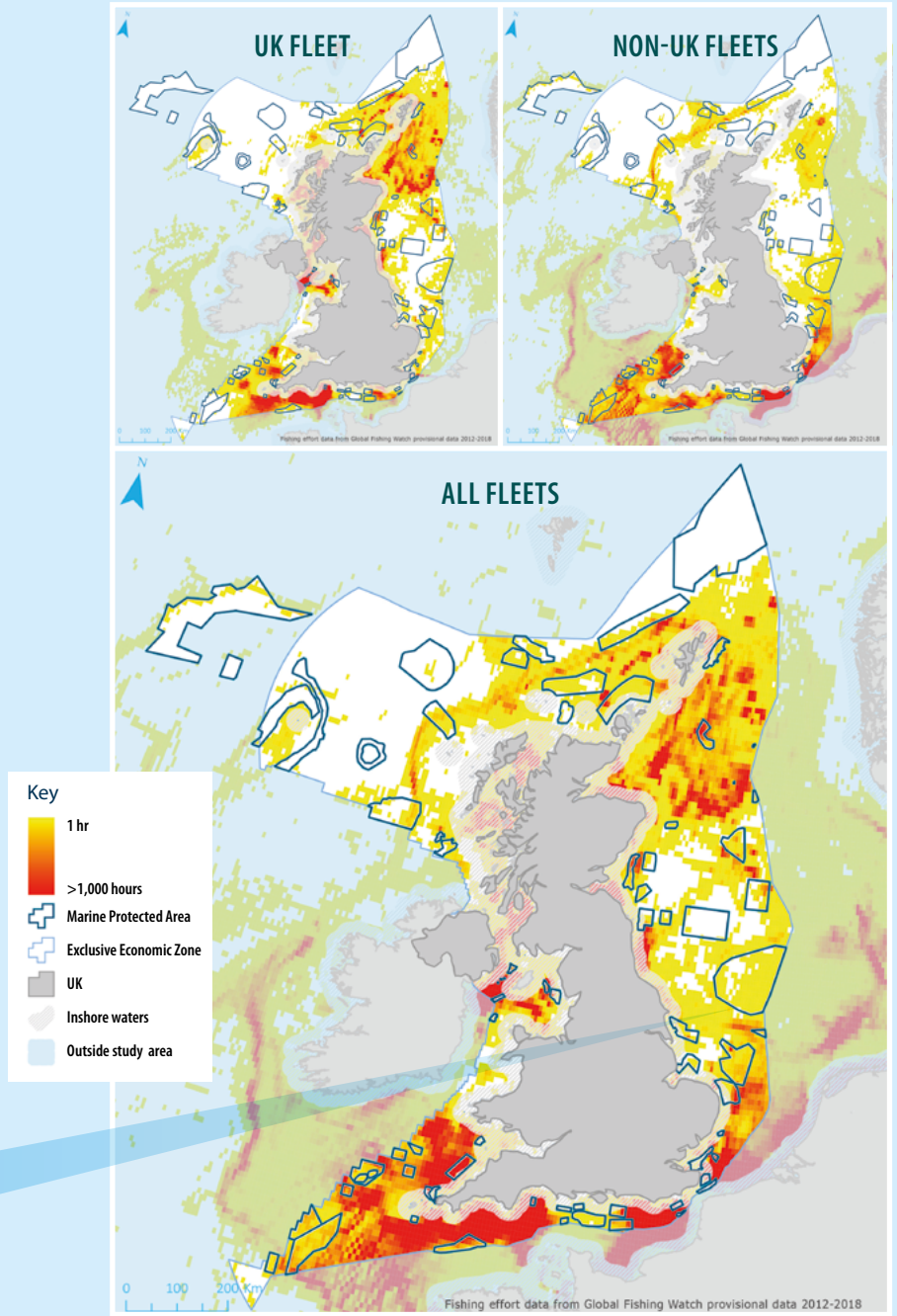
Dogger Bank Marine Protected Area experienced at least 2,623 hours of bottom trawling between 2015 and 2018. The UK and Dutch fleets were responsible for the majority of this type of fishing activity – UK fleet responsible for 42% and Dutch fleet responsible for 36%.

Continued trawling of Dogger Bank could cost the UK economy approximately £200 million over the next 25 years. The Marine Protected Area has the capacity to store the most carbon of all UK sites – equivalent to 31,000 return trips from London to Sydney.



Total of 2,623 fishing hours in Dogger Bank (UK) Marine Protected Area (2015-2018)

Compiled fishing activity from large vessels (>15m) in UK offshore seas 2015-2018



NB: Marine protected areas include benthic Special Areas of Conservation (SAC), Marine Conservation Zones (MCZ), and nature conservation Marine Protected Areas (npMPA). Data from Global Fishing Watch.

An opportunity

To date, management measures for Marine Protected Areas have required the agreement of EU member states. From 2021 UK Governments will have powers to fully manage bottom trawling in offshore Marine Protected Areas.

The Fisheries Act 2020 provides the opportunity for the UK Government (for England) and the Scottish, Welsh and Northern Irish Governments to manage fisheries in their offshore Marine Protected Areas.

We have a legal and societal responsibility to safeguard our seas, with Marine Protected Areas making a crucial contribution. As such these 'protected' habitats should be off limits to bottom trawling.

SCOTLAND: The Big Picture

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Through decisive action, we can allow our offshore Marine Protected Areas to recover from years of damage. This will:

- **Conserve seabed species and habitats** with major benefits for the diversity and complexity of lifeforms.
- **Reduce carbon emissions** by keeping organic carbon locked in the seabed rather than releasing it into the atmosphere, and by protecting species and habitats that capture carbon.
- **Sustain our food supply** with a rich seabed that boosts fish stocks. Biomass of fish communities in fully protected areas is, on average, six to seven times greater than in adjacent unprotected areas and three to four times greater than in lightly protected areas.
- **Protect jobs in the fishing industry** and those that rely on it – in areas where no-take zones are large and well established, commercial fish catches at the boundaries of sites are significant and consistent.
- **Save money** – economic studies† of the value of fully protected Marine Protected Areas show considerable returns on investment; every £1 invested returns approximately £20 in benefits. The costs of not protecting our offshore Marine Protected Areas from bottom trawling are estimated to be up to £980 million over 25 years.

† Brander et al (2015)

Stories of recovery

GEORGES BANK, MAINE, USA

After just five years of protection, the densities of legal-sized scallops reached 9 to 14 times those of scallops in other areas.

Rejuvenated fish stocks swim out of the Marine Protected Areas into fished waters, so fishers can fish less hard, using less fuel and for a shorter time to make the same catch. After banning trawls, 70% of the fishing effort is concentrated within 5km of the boundary.

EDMONDS UNDERWATER PARK, WASHINGTON, USA

Copper rockfish have produced 100 times more eggs than their species counterparts outside of the marine park boundary.

SAINT LUCIA, CARIBBEAN

Catch densities increased between 46 and 90% within five years outside a network of fully protected areas.

Warming waters and reduced oxygen killed most pink abalone in 2010 but the larger, highly reproductive abalone that survived in the nearby fully protected area replenished the abalone stocks for the entire region.

ENGLAND, SCOTLAND, WALES AND ISLE OF MAN

Within inshore Marine Protected Areas around the Isle of Arran and Lyme Bay, carbon storing habitats, and animals like sponges, corals, squirts and hydroids now thrive on the seabed where dredgers and trawlers once operated.

Around the Isle of Man, Lundy, Skomer and the Isle of Arran, numbers of scallops and lobsters have increased in inshore Marine Protected Areas closed to dredges.

TSITSIKAMMA NATIONAL PARK, SOUTH AFRICA

The density of commercially important fish is around 42 times higher within one of oldest fully protected Marine Protected Areas in the world than in the nearby fishing grounds.

NEW ZEALAND

One snapper fishery is benefiting from 14 times more fish in fully protected areas than in fished areas, making egg production an estimated 18 times higher than outside the protected area.


Georgie Bull


Mark Kirkland


Georgie Bull


Keith Hiscock


Georgie Bull


Georgie Bull

The way forward

The UK urgently needs effectively managed Marine Protected Areas to help recover marine species and habitats, support sustainable fishing and combat climate change.

Now is the time to begin a transition towards a complete ban on bottom trawling in offshore Marine Protected Areas designated to protect seabed species and habitats. This transition can only happen by working with local communities and all who benefit from marine resources.

Approaches will differ in the countries of the UK…

SCOTLAND

Proposed fisheries management measures for offshore Marine Protected Areas should be updated by the Scottish Government to deliver a 'whole-site' approach to seabed protection. An independent commission should be established to enable transformation of Scotland's Marine Protected Area network and help ensure that a third of Scotland's seas are highly or fully protected by 2030.

ENGLAND

The 'whole-site' approach to management of Marine Protected Areas should be applied, in line with the Government's 25 Year Environment Plan commitment. The Marine Management Organisation can then use its new powers to close offshore Marine Protected Areas to bottom trawling, restoring ecosystems across the entire network of sites.

WALES

The designation of offshore Marine Conservation Zones for important seabed species and habitats is pending. Following designation, the Welsh Government will need to introduce strict management measures within these sites that will prevent damage to the seabed and associated species.

These measures can be introduced through the use of permit conditions on the general fishing licence and the introduction of remote electronic (real-time) monitoring with cameras on vessels to help monitor catches and support compliance with management measures.

The government's carbon accounting process should consider the UK's seabed sediments as both a potential source of carbon emissions or as a valuable carbon sink.

To date, agreeing fisheries management measures for offshore Marine Protected Areas through an EU consultation and evidence gathering process has been complicated by changing dynamics between other EU member states and the UK.

Now, with the powers provided by the Fisheries Act 2020, the UK Governments can act more independently to recover our seas and combat climate change. **There is no time to lose.**

This report is the culmination of extensive research and in-depth analysis conducted by scientists at the Marine Conservation Society.

Using data from peer-reviewed scientific literature and Global Fishing Watch, the work provides a valuable insight into the pressures faced by the UK's seabed even where it is, on paper, protected.

For more information about the context, methodology and findings of this work, please see our detailed report at: www.mcsuk.org

For insights into how fully we are protecting and managing our marine environment from seabed trawling in English seas, visit: mpa-reality-check.org

For details in Scotland: www.savescottishseas.org

Want to know more? Please contact us: info@mcsuk.org

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Front and back cover SCOTLAND: The Big Picture

Curriculum Links - England

Key Stage 3

Science

- Interactions and interdependencies
- Relationships in an ecosystem
- How organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

Geography

- Human and physical geography
- Understand, through the use of detailed place-based exemplars at a variety of scales, the key processes in:
    - Physical geography relating to: Change in climate from the Ice Age to the present, coasts.
    - Human geography relating to: Economic activity in the primary, secondary, tertiary and quaternary sectors; and the use of natural resources.
- Understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems.

Key Stage 4

Science

- Ecosystems
    - Some abiotic and biotic factors which affect communities; the importance of interactions between organisms in a community.
    - Positive and negative human interactions with ecosystems.

Geography

- Place: processes and relationships
    - Geography of the UK – Knowledge and understanding of the UK's geography, both in overview and with some in depth study, to include its physical and human landscapes, environmental challenges, changing economy and society, the importance of cultural and political factors, and its relationships with the wider world. Much of this may be achieved by study in combination with other physical, human and environmental study topics, but students must also study the UK as a country and draw across physical and human characteristics to summarise significant geographical features and issues.

- People and environment: processes and interactions
    - Resources and their management – An overview of how humans use, modify and change ecosystems and environments in order to obtain food, energy and water resources. Detailed study of one of either food, energy or water, recognising the changing characteristics and distribution of demand and supply, past and present impacts of human intervention, and issues related to their sustainable use and management at a variety of scales.

Curriculum Links - Wales

Progression Step 4

Science

- Being curious and searching for answers is essential to understanding and predicting phenomena.
    - I can explain how the impact of our actions contribute to the changes in the environment and biodiversity.

Humanities

- Events and human experiences are complex, and are perceived, interpreted and represented in different ways.
    - I can express, discuss and justify my personal opinions and understand that interpretations can change over time, especially in the light of new evidence or when approached from a different perspective.
    - I can infer and evaluate opinions, viewpoints and interpretations from a range of sources and evidence in order to develop my own informed judgements.
    - I can explain, using a range of evidence, why people have different interpretations and that interpretations are influenced by the availability, validity and credibility of evidence, identity, experiences, viewpoints and beliefs.

- Our natural world is diverse and dynamic, influenced by processes and human actions.
    - I can understand and explain how human actions affect the physical processes that shape places, spaces, environments and landforms over time.
    - I can understand and explain how significant places, spaces environments and landforms in the natural world are associated with economic, historical, political, and religious and non-religious beliefs and practices.

- Informed, self-aware citizens engage with the challenges and opportunities that face humanity, and are able to take considered and ethical action.
    - I have an understanding of my own and others' environmental, economic and social responsibilities in creating a sustainable future.

Curriculum Links - Wales

Progression Step 5

Science

- Being curious and searching for answers is essential to understanding and predicting phenomena.
    - I can evaluate contemporary issues that affect the planet and biodiversity.

Humanities

- Events and human experiences are complex, and are perceived, interpreted and represented in different ways.
    - I can appreciate a variety of perspectives on the world, recognise the limitations of my own perspective and have begun to challenge my values and opinions.
    - I can analyse, explain and evaluate the validity of opinions, viewpoints and interpretations, considering how they are shaped and influenced by a variety of factors, and how they can change over time. Subsequently, I can develop my own informed and justified judgements.
    - I can explain how and why a range of different interpretations are formed and how they may change over time.

- Our natural world is diverse and dynamic, influenced by processes and human actions.
    - I can explain and analyse the wide range of interrelationships and interdependencies between the human actions and physical processes that shape places, spaces, environments and landforms over time
    - I can evaluate the extent to which economic, social, political, cultural, religious and non-religious beliefs, practices and actions have led to changes to the natural world.

- Informed, self-aware citizens engage with the challenges and opportunities that face humanity, and are able to take considered and ethical action.
    - I can explain the importance of the role played by groups, governments, businesses and non-governmental organisations in the creation of a sustainable future, and how they impact on people and their rights and on the environment.

Curriculum Links - Scotland

Third-Fourth Level

Social Sciences – Third Level

- People, place and environment
    - I can identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact.
    - I can investigate the climate, physical features and living things of a natural environment different from my own and explain their interrelationship.

- People in society, economy and business
    - I can use my knowledge of current social, political or economic issues to interpret evidence and present an informed view.

Social Sciences - Fourth Level

- People, place and environment
    - I can discuss the sustainability of key natural resources and analyse the possible implications for human activity.
    - I can develop my understanding of the interaction between humans and the environment by describing and assessing the impact of human activity on an area.

Curriculum Links - Scotland

Senior Phase

Environmental science

Level 4

- Sustainability
    - The sustainability of key natural resources and possible implications for human activity; the interaction between humans and the environment and the impact of human activity on an area; the role of agriculture in the production of food and raw material and its environmental impacts and sustainability; society's energy needs and the impact of developments in transport infrastructure in a selected area; and development of sustainable systems.

Level 5

- Living Environment
- Human influences on biodiversity.
- Earth's Resources
- Biosphere.
- Sustainability
- Introduction to sustainability.

Geography

National 4

- Skills, knowledge and understanding
    - Demonstrating knowledge and understanding of the physical environment of Scotland and/or the United Kingdom by giving factual descriptions and straightforward explanations.
- Global Issues
    - Climate change; the impact of human activity on the natural environment; environmental hazards; trade and globalisation; tourism and health.

National 5

- Skills, knowledge and understanding for the course
    - Demonstrating knowledge and understanding of the physical environment of Scotland and/or the United Kingdom by giving detailed descriptions which are mainly factual with some theoretical content, and giving detailed explanations.
- Global issues
    - Climate change
    - Natural regions
    - Trade and globalisation
    - Tourism