

# The Atlantic Ocean

## Where is it?

The Atlantic Ocean occupies an elongated, S-shaped basin extending between the Americas to the west, and Eurasia and Africa to the east. In the north and north-east, it is separated from the Arctic Ocean by the Canadian Arctic Archipelago, Greenland, Iceland, Jan Mayen, Svalbard, and mainland Europe.

Boundaries to the east of the ocean are: Europe, the Strait of Gibraltar and Africa. In the southeast, the Atlantic merges into the Indian Ocean, the border being defined by the 20° East meridian, running south from Cape Agulhas to Antarctica.

It is connected in the north to the Arctic Ocean (which is sometimes considered a sea of the Atlantic), to the Pacific Ocean in the southwest, the Indian Ocean in the southeast, and the Southern Ocean in the south.

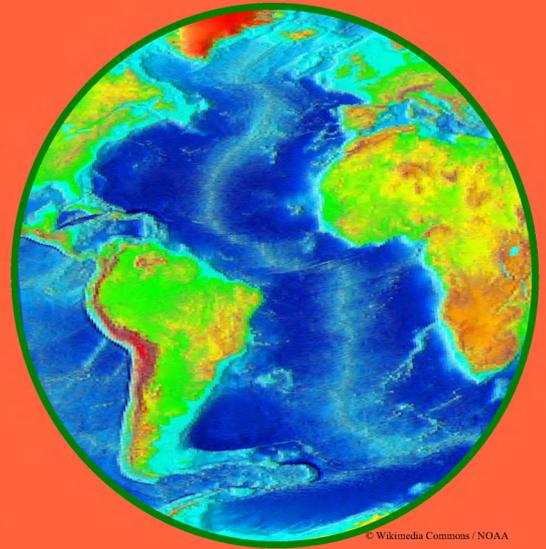
The equator subdivides it into the North Atlantic Ocean and South Atlantic Ocean.

## In Greek mythology,

the Atlantic refers to an Atlas.

The oldest known mention of the Atlantic Ocean is contained in *The Histories* of Herodotus around 450 BC .

Before Europeans discovered other oceans, the term "ocean" was synonymous with the waters beyond Western Europe that we now know as the Atlantic and which the Greeks had believed to be a gigantic river encircling



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## The Atlantic Ocean in numbers

- It covers approximately **one-fifth** (approx. 22%) of the Earth's surface
- 82,400,000 square km (31,800,000 sq mi)
- The volume of the Atlantic Ocean is 323,600,000 cubic km (77,640,000 cu mi)
- The average depths with its adjacent seas, is 3,339 meters (10,936 ft); without them it is 3,926 meters (12,881 ft)
- The width varies from 2,848 kilometers (1,770 mi) between Brazil and Sierra Leone to over 6,400 km (4,000 mi) in the south.
- The **greatest depth**, 8,605 meters (28,232 ft), is in the Puerto Rico Trench.
- The lowest point is Milwaukee Deep in the Puerto Rico Trench -8,605 meters (-28,232 ft)

The **Climate** of the Atlantic Ocean and adjacent land areas is influenced by the temperatures of the surface waters, water currents and winds.

Because of the ocean's great capacity for retaining heat, maritime climates are more moderate and much less variable through the year than inland climates.

Climatic zones vary with latitude; the warmest climatic zones stretch across the Atlantic north of the equator. The coldest zones are in the high latitudes, with the coldest regions - areas covered by sea ice.

Ocean currents are climatic controllers by transporting warm and cold waters to other regions. Adjacent land areas are under strong influence of the winds which blow over these currents. The Gulf Stream and its northern extension towards Europe, i.e. the North Atlantic Drift, warms the atmosphere of Britain, Ireland and north-western Europe.



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## Water conditions

On average, the Atlantic is the saltiest of the world's major oceans; the salinity of the surface waters in the open ocean ranges from 33 to 37 parts per thousand (3.3 - 3.7%) by mass and varies with latitude and season.

Surface salinity values are influenced by evaporation, precipitation, river inflow, and melting of sea ice. Although the minimum salinity values are found just north of the equator (because of heavy tropical rainfall), in general the lowest values are in the high latitudes and along coasts where large rivers flow into the ocean. Maximum salinity values occur at about 25° north and south of the equator, in subtropical regions with low rainfall and high evaporation.

Surface water temperatures, which vary with latitude, current systems, and season and reflect the latitudinal distribution of solar energy, range from less than -2 °C to 29 °C (28 °F to 84 °F).



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The Atlantic Ocean has **irregular coasts** indented by numerous bays, gulfs, seas and a number of islands.



Manatee

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## What lives there?

The Atlantic Ocean is a home for many endangered marine species of flora and fauna. Sea grass, turtles, fish (i.e. cod, sharks, rays), mammals: manatee, seals, sea lions and whales and many many more ... are living here and waiting to be saved from extinction.

# Threats to the Atlantic Ocean!

Threats include: **sludge pollution** off the eastern United States, southern Brazil, and eastern Argentina; **oil pollution** in the Caribbean Sea, Gulf of Mexico, Lake Maracaibo, Mediterranean Sea, and North Sea; and **industrial waste and sewage pollution** in the Baltic Sea, North Sea, and Mediterranean Sea; **tourism, ship pollution, overfishing and by-catch, alien species** and finally **climate change**...

The future of the Atlantic Ocean and its inhabitants is ultimately decided by the course of action we take with regard to these threats.



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Thames Barrier - London



Oil platform

**Ships** can pollute the oceans in several ways: noise, spills from oil tankers and chemical tankers, ejection of sulfur dioxide, nitrogen dioxide and carbon dioxide gases into the atmosphere from exhaust fumes, discharge of cargo residue from bulk carriers.

Ballast waters are source of invasive species and also oil pollution. Discharges into coastal waters along with other sources of marine pollution have the potential to be toxic to marine plants, animals, and microorganisms causing alterations such as changes in growth, disruption of hormone cycles, birth defects, suppression of the immune system, and disorders resulting in cancer, tumors, and genetic abnormalities or even death. They may also have the opposite affect upon some marine life stimulating growth and providing a source of food.

Increasing trade and transportation has become another serious threat to the world's oceans and waterways as globalization continues. It is expected that, "...shipping traffic to and from the USA is projected to double by 2020."

## Did you know?

"In one week, a typical cruise ship (up to 5000 people) generates 210,000 gallons of black water (sewage), 1,000,000 gallons of gray water (shower, sink, dishwashing water), 37,000 gallons of oily bilge water, more than eight tons of solid waste, millions of gallons of ballast water containing potential invasive species, and toxic wastes from dry cleaning and photo processing laboratories."



Sunfish

© Wikimedia Commons / Nol Aders

## Marine Invasive species

The comb jellyfish *Mnemiopsis leidyi* is believed to be one of the worst invasive species. It inhabits estuaries from the United States to the Valdés peninsula in Argentina along the Atlantic coast. It was first introduced in 1982, and thought to have been transported to the Black and Caspian Seas in a ship's ballast water. Its dynamic extension caused significant falls in the fish stocks haven exhausted the zooplankton, including fish larvae, so their numbers have fallen dramatically.



Bottlenose Dolphin

## Climate change

The Atlantic Heat Conveyor (which includes the Gulf Stream) helps to maintain relatively mild temperatures in north-west Europe. Some observations suggest that the Atlantic Heat Conveyor has reduced in strength by up to 30% since the early 1990s. It is possible that the Atlantic Heat Conveyor will slow during this century, but not sufficiently to completely offset warming across the UK and Ireland. However more data is needed to distinguish this trend from natural variability, which has recently been shown to be large on a day-to-day basis.

## Do you know what MARPOL 73/78 is?

MARPOL 73/78 is the International Convention for the Prevention of Pollution From Ships established in 1973 and modified by the Protocol of 1978. ("Marpol" is short for marine pollution and 73/78 short for the years 1973 and 1978.)

**The future of the oceans and seas is in our hands.**

# The North Sea

## Where is it?

**Location:** Atlantic Ocean

The North Sea is a shallow, north-eastern arm of the Atlantic Ocean, located between the British Isles and Ireland and the mainland of north-western Europe.

It becomes the English Channel in the south-west beyond the Straits of Dover. It is connected to the Atlantic by the Strait of Dover and the English Channel and opens directly onto the ocean between the Orkney and Shetland islands and between the Shetland Islands and Norway. The Skagerrak, an eastward extension of the North Sea between Norway and Denmark, connects the North and Baltic seas via the Kattegat and the Danish straits.

## How big and deep is it?

> 970 km long (600 miles)

560 km wide (350 miles)

With an area of around 570,000 km<sup>2</sup> (222,000 square miles)

Average depth is about 100 m (325 ft)

Maximum depth of 700 m (2300 ft)

This places the North Sea at the 13th largest sea on the planet

## Biomes

are the world's major communities, sorted according to their main vegetation and characterized by adaptations of creatures to that particular environment - Aquatic, Grasslands, Deserts, Forests and Tundra.

## Which biomes does the North Sea belong to?

The North Sea falls into three biomes: Temperate deciduous forest, Tundra and Taiga.



© Wikimedia Commons - Fredrik de Grefsköld

Geirangerfjord

## Who lives there?

Seven countries have a coastline on the North Sea: Norway, Great Britain, Denmark, Germany, the Netherlands, Belgium and France.



© Wikimedia Commons - NASA

## What lives there?

The North Sea is a home to about 230 species of fish. Cod, haddock, whiting, saithe, plaice, sole, mackerel, herring, pouting, sprat, and sand eel are the main target of commercial fishing.

Crustaceans - Norway lobster, deep-water prawns, and brown shrimp are also commonly found throughout the sea and are all commercially fished. Other species of lobster, shrimp, oyster, mussels and clams are also found.

Populations of Northern fulmars, Black-legged Kittiwakes, Atlantic puffins, razorbills, and a variety of species of petrels, gannets, seaducks, loons (divers), cormorants, gulls, auks, and terns, are also the main inhabitants of the North Sea coasts .

The North Sea is also a home to a variety of marine mammals. Common seal and grey seal are common residents along the coasts. The very northern North Sea islands like the Shetlands are occasionally home to a larger variety of pinnipeds: bearded, harp, hooded and ringed seals, walrus as well.



Northern gannet

© Wikimedia Commons - Michael Haderkamp

## What is the weather like?

The area is under Maritime Temperate climates or Oceanic climates influence. These climates are dominated all year round by the polar front, leading to changeable and often overcast weather. Summers are cool due to cloud cover, but winters are milder than other climates in similar latitudes. Average air temperatures vary in January from 32 to 40 °F (0 to 4 °C) and in July from 55 to 64 °F (13 to 18 °C). Winters are stormy and strong winds are common. Tidal ranges average between 13 and 20 feet (4 and 6 meters) along the coasts of Britain and in the southern estuaries, while the range to the north and east is less than 10 feet (3 meters).

## Did you know?

Historically, flamingos, pelicans, and great auks could have been inhabitants along the southern shores of the North Sea.

Massive exploitation of the Great Auk ,through the collection of its eggs ,drastically reduced the population.

The Gray whale used to be a common resident in the North Sea. Overfishing was the cause of its extinction in the Atlantic in the 1600s.

The Sperm Whale is the largest species of toothed whale, with adult bulls (males) growing to be about 15-18 meters (50-60ft) long and weighing about 45-70 tones.



Great Auk

© Wikimedia Commons - Scott J. Elly

The North Sea cetaceans include harbour porpoises, common dolphins, bottlenose dolphins, Risso's dolphins, long-finned pilot whales and white-beaked dolphins, minke whales, killer whales, and sperm whales.



Risso's dolphin

© Wikimedia Commons - Mike Beard

The constant mixing of waters in the shallow sea basin provide a rich supply of nutrient salts upon which the lower forms of marine organisms (the basis of the sea's food chain i.e. plankton) depends on. Phytoplankton and zooplankton are a varied and rich food supply for commercially valuable fish. Copepods which belong to zooplankton are a crucial element of the North Sea food chain by being often the basic source of food for many species of fish, birds and whales.

# Threats to the North Sea!



Closure Dike from satellite

Closure Dike - major dam in The Netherlands

## Human activities

The main threats to the North Sea marine life are : the introduction of non-indigenous species (introduced species), industrial and agricultural pollution, overfishing and trawling, dredging, human-induced eutrophication, construction on coastal breeding and feeding grounds, sand and gravel extraction, offshore construction, and heavy shipping traffic.



Port of Antwerp-- Delwaide Dock

## Trade and transportation

The North Sea is one of the busiest shipping areas in the world. Merchant and fishing vessels operate within the North Sea area only and transit traffic as well; exploration-offshore oil and gas platforms - have severe effects on fisheries and other marine life. The Europort complex at Rotterdam (Netherlands) is one of the world's leading ports in cargo tonnage handled, and Antwerp (Belgium) and Hamburg are also among the largest. Other major North Sea ports include London, Dunkirk (France), and Bremerhaven and Wilhelmshaven.

## Pollution

Ship accidents as well as land-based pollution, including the dumping of sewage and industrial wastes (particularly in the southern part of the North Sea) are the main sources of contamination. Over the years, the coastal countries of the North Sea have concluded international agreements designed to minimise dumping of hazardous wastes at sea, the discharge from land of certain toxic materials, and the incineration of wastes at sea. However, enforcement powers are limited, and pollution remains a critical issue in certain parts of the sea.

## Overfishing

Dramatic declines have been noticed in many populations of fish. Right whales, sturgeon, shad, rays, skates and salmon among other species were common in the North Sea into the 20th Century. Numbers declined due to overfishing. The major fishing countries within the North Sea area are Norway, Denmark, the United Kingdom, and The Netherlands. A unique fisheries arrangement called the **Common Fisheries Policy** was adopted by members of the European Community in 1983 to prevent overfishing process. A review of the Common Fisheries Policy in 1992 resulted in the establishment of a stricter monitoring program, including observers aboard fishing vessels. Additional reforms of the policy were adopted in 2002 (implemented 2003) to ensure the ecological and economic sustainability of the fishing industry.



Cod

The North Sea cod are managed through a multi-annual plan aiming at the recovery of cod stocks, which started in 2003. Currently, the plan is being reviewed by the European Commission and stakeholders with a view to agree on a new plan by 2009. Scientists from the International Council for the Exploitation of the Sea (ICES) have announced that cod stocks continue to be chronically overfished in almost all European waters and recommended **zero catches** i.e. we stop fishing for cod!

## Climate change

Marine air and sea surface temperatures have been rising at a similar rate to land air temperature, but with strong regional variations. Since the 1980s the rate of rise has been about 0.2–0.6 °C per decade. Climate change models indicate that temperatures will continue to rise in all waters around the UK coast, with stronger warming in the south-east (~0.15–0.4 °C per decade in the southern North Sea) than the north-west .

Thousands of marine species are transported, either intentionally or accidentally, from their native range to "new" areas.

**These species are called non-native species and sometimes referred to as Alien or Invasive species.**

Introductions and transfer of non-native marine species to their non-native environment mainly occurs by the transport and discharge of ballast water, and to a lesser extent by transport of fouling organisms on hulls or through aquaculture. 26 introduced macrozoobenthic species were identified at the German North Sea coastal area only! The main origin of these invaders is the Atlantic coast of North America.

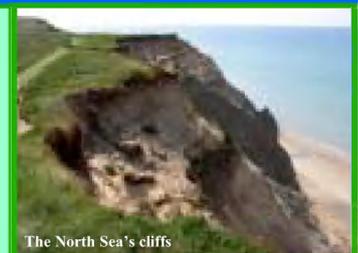


Minke whale

## Marine Protected Areas

The coasts of the North Sea are home to many nature reserves including the Ythan Estuary, Fowlsheugh Nature Preserve, and Farne Islands in the UK and the Wadden Sea National Parks in Germany.

These locations provide breeding habitats for dozens of bird species. Tens of millions of birds make use of the North Sea for breeding, feeding, or migratory stopovers every year.



The North Sea's cliffs

## Do you know what OSPAR is?

OSPAR is the Convention for the Protection of the Marine Environment of the North-East Atlantic created in 1992. This convention came into play as the border countries of the North Sea wanted to address threats to the North Sea. The name OSPAR comes from combining Oslo and Paris (two other Conventions on the North Sea). It is managed by the OSPAR commission and has taken action to counteract the harmful effects of human activity on wildlife in the North Sea and to preserve many endangered species.