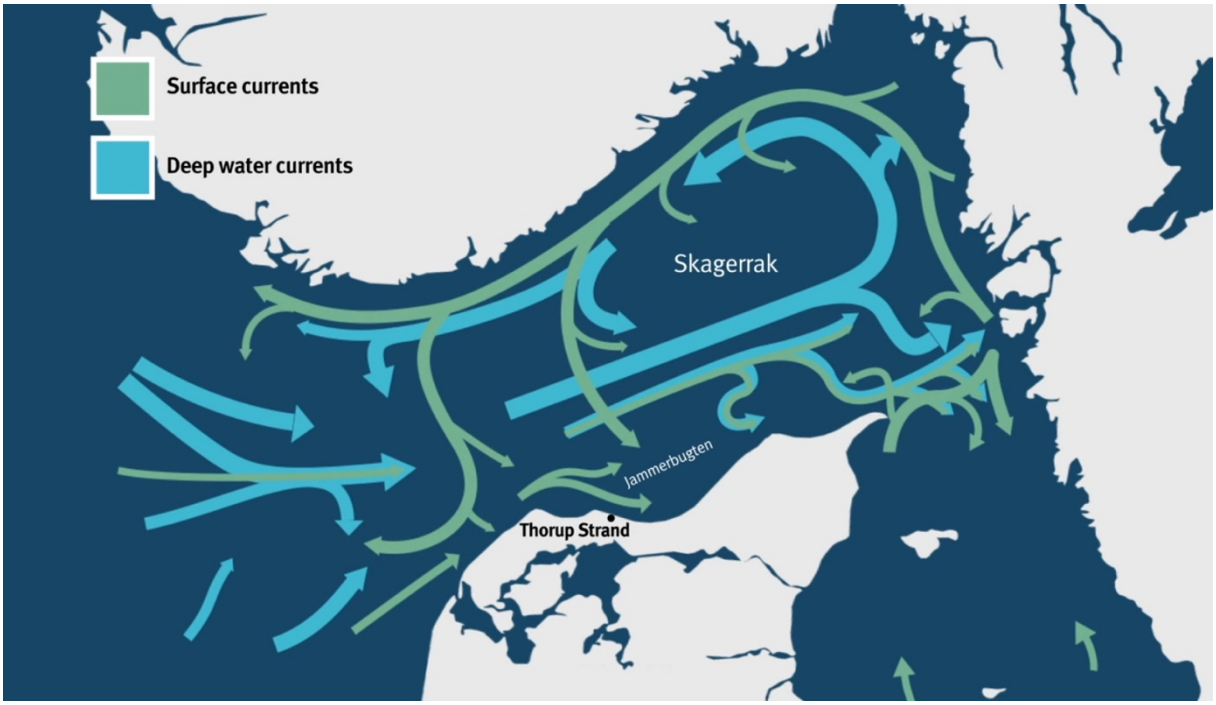
Unit 1 - Understanding the Ecosystem

It is helpful to get a short introduction into the oceanography and elements of the marine ecosystem in the marine area called Skagerak.

The fishing village Thorupstrand is located on the north faced coastline of Jutland, Denmark, in the bay called Jammerbugten. The seabed of Skagerrak, the northern part of the North Sea, is characterized by chalk reefs, gutters, gravel and sandy areas near land. Further out there are several successive rock reefs between the sandbanks, old peat- and forest floor, soft holes, seaweed forests and limestone peaks with sandy bottom areas between. In the middle of Skagerrak, the slopes down towards the 600 - 800 meters deep gorge of the Norwegian Deep begins – a landscape formed by the ice ages. From here, cold, salty and nutrient-rich ocean currents flow in from the Atlantic Ocean and meet the North Sea water from the south, while freshwater flows from the Baltic Sea. This creates large primary production and optimal living conditions in the ecosystems of the underwater landscape. Not only for fish such as cod (torsk) and plaice (rødspætter), but also for black lobster, crab, sole, octopus, catfish, monkfish, ling, turbot, grouse, halibut and all other Northeast Atlantic fish species.



During the summer, cod and plaice, target species for the local fishery, have the opportunity to move from the cold depths and into the warmer, richer sandy surfaces near the coast, and during the winter to move from the cold water at low depths near land and into the relatively warmer water in the depths – just as it suits them in relation to the changing temperature conditions of the seasons, the ocean currents, the supply of food items and their own reproductive needs. These conditions make it a highly diverse and species-rich marine ecosystem.

Skagerrak also holds a number of rare bubble reefs; biological reefs formed around cold seeps of geological carbohydrate outgassings, usually methane. These rare habitats are mostly

known from the Danish waters of Skagerrak west of Hirtshals, but more might be discovered in future surveys. Bubbly reefs are very rare in Europe and supports a very varied ecosystem.

Ecosystem under pressure

All parts of the North Sea and Skagerrak are influenced by human activity, though to varying degrees. This is putting pressure on ecosystems and on animals and plants at all levels in the food web. Some of the changes that have been observed in conditions in the North Sea and Skagerrak can be linked directly to human activity. In other cases, the causal relationships are more complex and human activity is only one of the factors involved.

There is considerable concern about cumulative environmental effects on ecosystems in the North Sea and Skagerrak, particularly the impacts of hazardous substances, nutrients and eutrophication, bottom trawling and fisheries more generally, marine litter and underwater noise.

In the time ahead, climate change and ocean acidification are expected to intensify and have greater impacts, increasing ecosystem vulnerability. A higher sea temperature will result in changes in ecosystems. For example, warmer-water species such as sardines and anchovy are likely to become established, while other species disappear. Moreover, we know that CO2 emissions are making the seas more acidic. Ocean acidification may become one of the greatest threats to marine life both in these waters and elsewhere.

It is difficult to assess the scale of cumulative environmental effects because in most cases there is insufficient information on particular species and on the complex interactions in ecosystems. In addition, it is difficult to assess how vulnerable an ecosystem is to change.