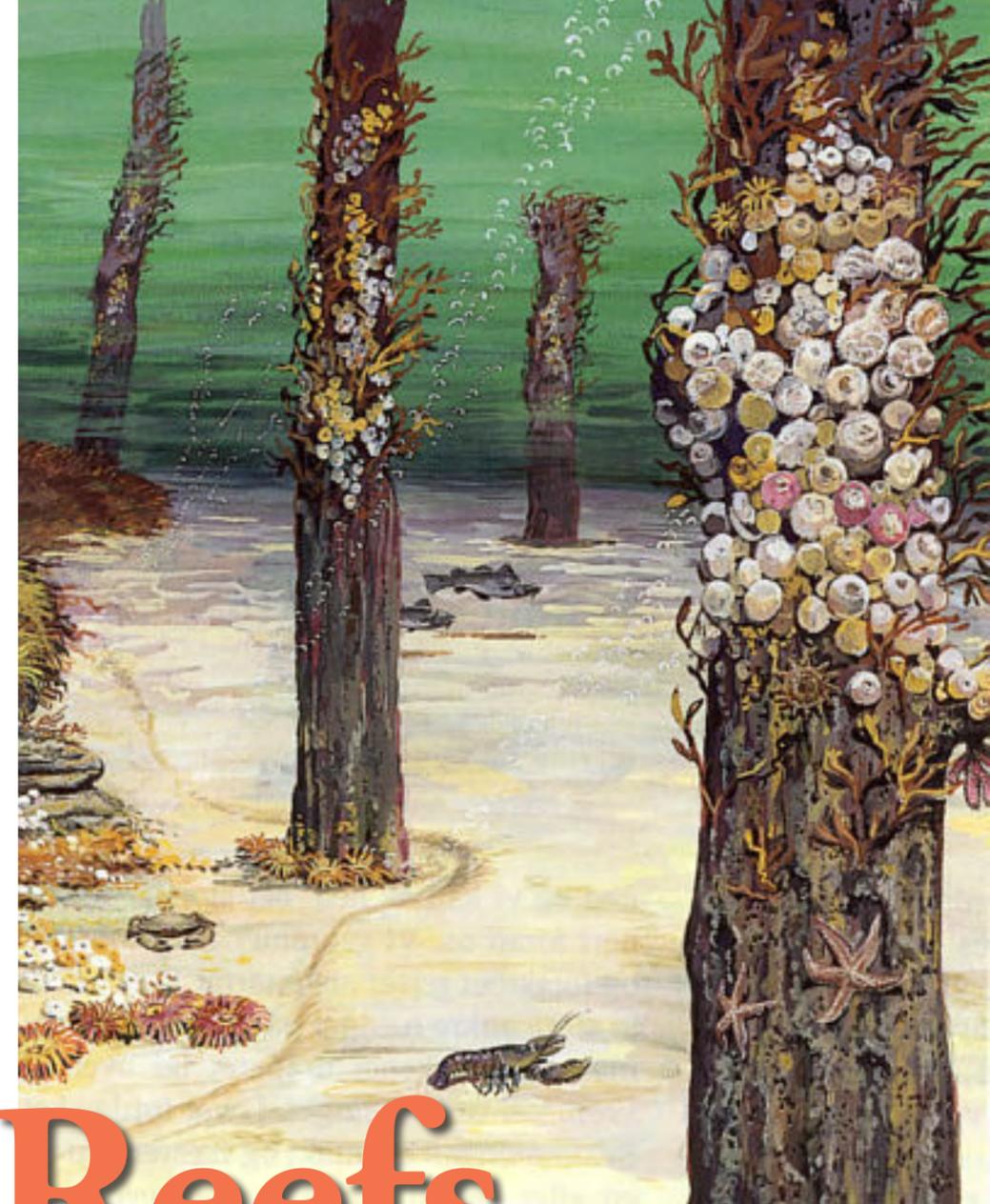
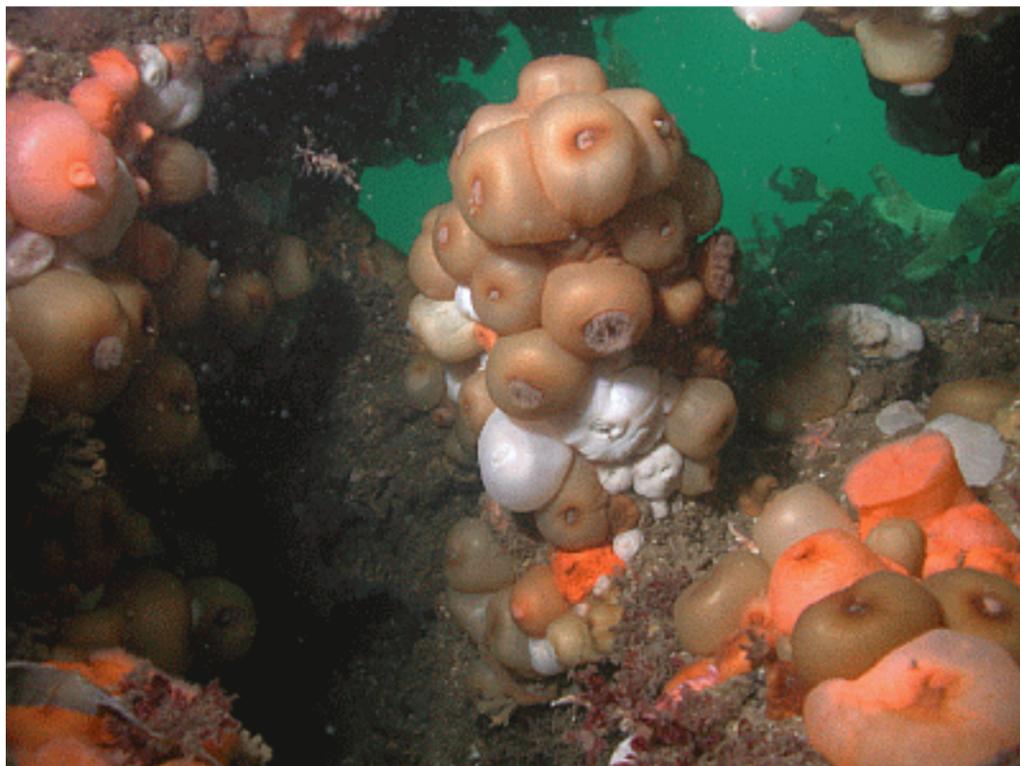


Unique Dive Site

Imagine a beautiful shallow green water reef with kelp, anemones and sponges among which lots of colourful fauna darting in and out and. Now imagine that the reef is growing on some weird sandstone arches and that the water is fizzy like sparkly mineral water, with bubbles coming out of the reef structure.

Text by Peter Symes
Photos and illustrations
courtesy of Hans Christian
Andersen, BubblingReefs.com



The Bubbling Reefs

At first glance, from a distance, the shallow stone reefs in the shallow water off the northern peninsula of Jutland, Denmark, does not seem to be much out of the ordinary. Diving in Denmark is all right—it has its moments and decent locations, but cannot compare to the often exceptional diving that the other brethren Scandinavian countries can offer—with a few exceptions, and this is one of them.

As you get closer, you will soon realise that this location is

anything but ordinary. The thriving reef is not only full of interesting macro life—in large part thanks to the marine reserve status the area enjoys—but delicate arches and pole-like structures poke out of the sand. The overgrowth of kelp and sponges gives them a furry appearance. But it is the slow fizz of bubbles coming out from the inside of these structures that gives the dive experience here a definitely surreal tint.

So, what's going on here?

The gas is methane, and what lies beneath the seabed is what you could call an oil field still in the process of forming.

The methane most likely stems from microbial decomposition of plant material deposited during the Eemian and early Weichselian periods, i.e. 100,000 to 125,000 years B.P. The gas then seeps up through the sandy seabed forming channels, or funnels, along the paths of least resistance.

As other aerobic microbes

in the upper layers oxidise the methane, they turn the loose sand into solid carbonate cemented sandstone structures. It is believed that the cementation occurred in the subsurface, and that the rocks were exposed in the open by subsequent erosion of the surrounding unconsolidated sediment. In other words, the surrounding sand was later washed away by changing currents, leaving the solidified parts standing free as a sculpture garden.

These structures can be up to 500 m² and consist of columns up to four meters high, arches, complex formations of overlying slab-type layers, and pillars up to 4m high. The rocks support a diverse ecosystem ranging from bacteria to macroalgae and anthozoans.

Many animals live within the rocks in holes bored by sponges, polychaetes and bivalves. Within the sediments surrounding the seeps, the abundance and diversity of metazoan fauna





Distribution of 'bubbling reefs' in the northern part of the Kattegat and in the Skagerrak off Hirtshals, and gas wells in Vendsyssel and on Læsø (light area). The seeps and gas wells follow a NW-SE direction parallel to faults along the Fennoscandian border

is poor—probably due to the toxicity of the hydrogen sulphide contents in the gas.

The Hirsholm islets

Hirsholmene (the Hirsholm islets) are located approximately five kilometers north-east of the port of Frederikshavn, at the tip of the Jutland peninsula. Beside the main islet, Hirshold, there is one larger islet, Græsholm, and a group of smaller islets called,



ABOVE & RIGHT: Views of the columns that rise up from the sea floor at the bubbling reefs. Images captured and compiled from the DiveFilm Podcast Video by Hans Christian Andersen, which can be viewed at: www.mefeedia.com

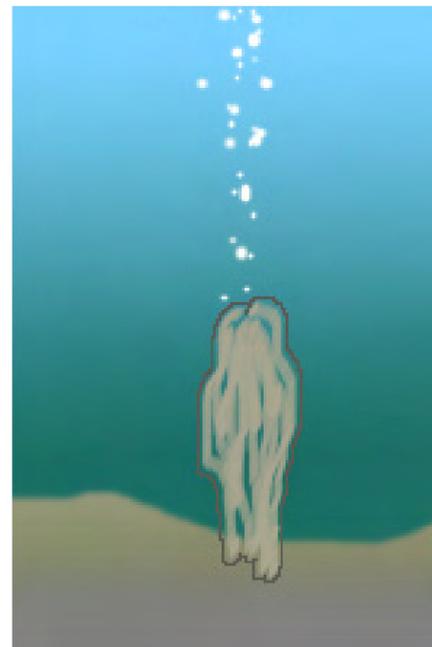
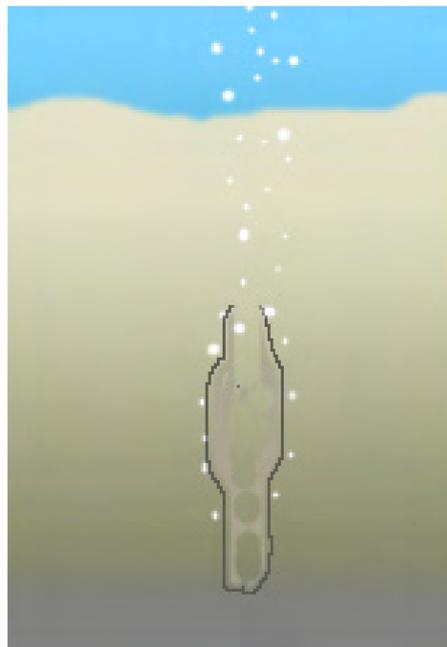
Tyvholm, Kølpén and Deget, making up about 45 hectares all together.

Only the biggest islet is inhabited, most of the time by no more than 8-10 residents though through the summer season. Yachters will visit or come over by a small ferry.

The islets are state-owned and surrounded by territorial waters. In 1929, the site was declared a Scientific Sanctuary, mainly

due to the vast number of birds nesting on the islets, including a number of rare and protected species.

In 1981, the reserve was expanded to include the surrounding sea area consisting of about 2,400 hectares. The landscape is dominated by rocky embankments and banks of deposited sand and sediments along the beaches. On some of the islets, the rocks

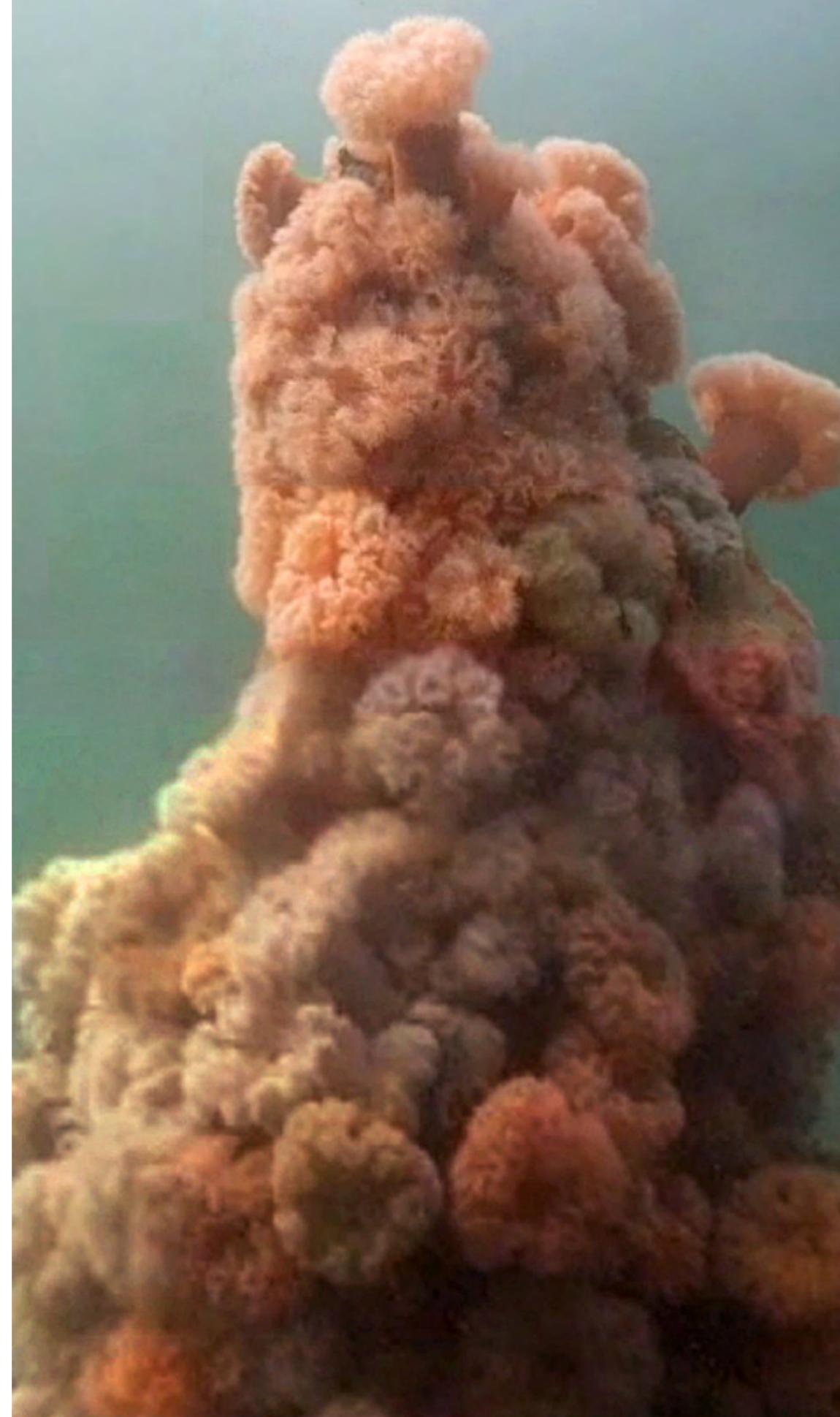


Proposed formation of a 4 m high pillar at 10 m water depth in the Kattegat:

(A) Methane-oxidation induces precipitation of carbonate, which lithifies the sediment along gas channel.

(B) Cementation of sediment fills channel and the pillar structure grows from outside.

(C) Exposure of the carbonate-cemented sandstone pillar on sea floor as a result of erosion of unconsolidated sediment; methane seepage visible in the vicinity. Erosion may have been triggered by post-glacial isostatic uplift in the Kattegat





THIS PAGE: Some of the marine life found at the bubbling reefs
 ABOVE: Detail view of the spines on a starfish

have been covered by a thin layer of top soil formed by decomposed seaweed.

The small islets, Tyvholm and Kølpen, are almost completely barren and consist only of rocks, giving an impression of how the whole area looked in times past.

Sediment carried by currents around the islets have been deposited in some locations creating small sandy beaches, especially on the north side of Græsholm and the main Islet, Hirsholm. The site is important for marine biology research. There is a visitor centre at the site.

Diving there

There are no regular dive trips going out there, although some of the local dive shops in Northern Denmark will occasionally put excursions to the islets on their tour programmes.

The islets are only 20-30 minutes sailing with a RIB from the main coastline, so dive clubs, or dive centres, will often launch their boats from a jetty in one of the local marinas. Diving is easy with depths ranging from only 9-12 meters, although visibility can vary from the extraordinary to pea soup. ■

LEFT: *Alcyonium digitatum*, attaches itself to rocks, shells and stones in locations with strong currents and where the normally predominant algae do not grow to abundance due to lack of light or the presence of preying crabs and gastropods. Found on the lower shore but more often sublittorally at depths of approximately 50m

CENTER INSET: One of the largest species of jellyfish, *Cyanea capillata* is commonly called the Lion's mane jellyfish because of its highly distinguishable mass of thin, long, hair-like tentacles. Growing up to 30-50cm in diameter, it is usually yellowish brown or reddish in colour



ABOVE: Instead of scales, *Agonus cataphractus* is totally covered with hard bony plates aligned in lateral rows of sharp spines. It has a wide, flattened, triangular head that is over three times its body length, which is elongated and tapered. This fish can grow up to a length of 21cm

TOP LEFT: *Metridium senile* is an anemone, which varies a lot in its form and can grow up to 30cm. Its irregular base is wider than the column. Its many tentacles make a 'plume' over a parapet at the top of a smooth column when the anemone is expanded

Illustration of the underwater landscape at the bubbling reefs