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Making the Right Choice :: OC & CCR Mixed Teams :: JJ-CCR :: Dray van Beeck Portfolio

SCANDINAVIA

Denmark

Wrecks
Jutland to Øresund

Freshwater Dive
Slåensø

Danish
Diving & Dining

Italy
Plinio III

Russia
Teletskoye

Contributors' Picks
My Most Unusual Dive

COVER PHOTO BY RENÉ BRUNO NIELSEN

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COVER PHOTO: *Lumpsucker, Denmark,* by René Bruno Nielsen

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Diver inspects 19th century cannon on the Cannon Wreck, Øresund, Denmark. Photo by René B. Andersen

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Coming full circle

Over the 18 years we have published this magazine, we have covered much of the planet—except for the place where I actually got certified and had my first hundred dives or so, the place I know better than any other place in the world. That is, until this issue.

That country, in which we are still based, is Denmark—the southernmost part of Scandinavia.

It is quite a small country, yet this theme issue on Denmark is the longest we have ever put together.

Still, it feels like it is not long enough, that many interesting locations, sights and facts that should be contained in these pages have not been included.

I certainly now brace myself for complaints from the locals about why this or that location was not even given a mention, why some spectacular wreck was passed over, or why a region with unique dive sites was not included.

And they would be mostly right. There is so much more to this country and the diving here than we can reasonably cover in one issue, even with an extended theme feature. So, please consider it just a primer.

Once you really start exploring a location and get to know it, more options and sites to explore seem to emerge, providing more than a lifetime's worth of experiences under the surface.

That is surely true for this country where I had my first dive some 33 years ago and where I hope to have many more dives before I hang up my flippers.

I suppose it is also true for many other locations across the planet, which makes diving an endeavour that never runs dry of something new and interesting to try, and which keeps on giving time and time again.

For more insight into the diving in Denmark from a fellow denizen, please read the welcoming letter from Jesper Risløv, President of the Danish Sportdiving Federation, on the first page (p.10) of the Denmark theme.

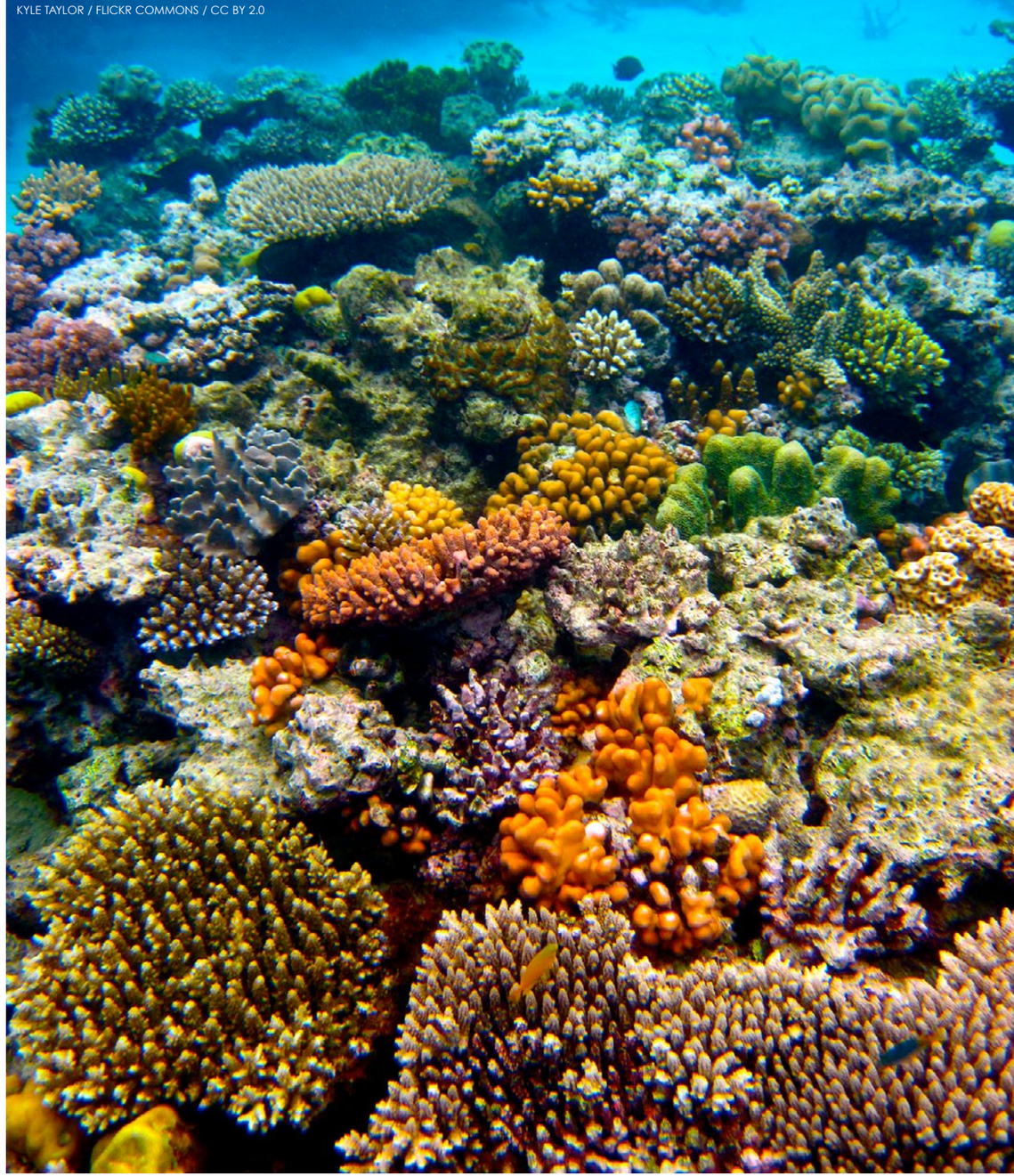
— Peter Symes
Publisher & Editor-in-Chief

Edited by
Catherine GS Lim

from the deep

NEWS

Corals on the
Great Barrier Reef
in Australia



KYLE TAYLOR / FLICKR COMMONS / CC BY 2.0

Deciphering the corals' scents

At the Great Barrier Reef, a team of researchers from the Climate Change Cluster at University of Technology Sydney have employed advanced analytical chemistry techniques to detect and measure the volatile chemicals corals release.

Last December, marine biologist Caitlin Lawson made her way to the Great Barrier Reef. Like countless others, she was there for the annual spawning of the corals. However, she was armed, not with expensive photographic equipment, but small plastic containers rigged with tubing.

Her mission? To collect the gaseous chemicals released by the corals (as well as their algal and bacterial symbionts) before, during and after the spawning event.

Volatile gasses

All organisms release volatile gases and the mix of these gasses emitted is an indication of the organisms' health and can even influence how it copes with stress.

This process has been much studied in the case in terrestrial organisms, but not so in underwater organisms. Until now.

Analytical chemistry

After collecting the samples at the Great Barrier Reef, Dr Lawson (from the Climate Change Cluster at University of Technology Sydney) and her team used advanced analytical chemistry techniques to characterise and measure the volatile chemicals released by the corals.

The findings of this study, which was published in the *Global Change Biology* journal, focused on two common reef-building corals—*Acropora intermedia* and *Pocillopora damicornis*—and the effect heat stress (read climate change) had on their gaseous emissions.

"Our results provide the first insights into the range of gases produced by reef-building corals and highlight a diverse suite of compounds that may play potentially important—but previously unrecognised—roles in maintaining healthy reef functioning," said Lawson.

Heat stress

During heat stress experiments in which the water temperature was increased by five percent, the abundance and chemical diversity of the corals' gas emissions fell significantly; this occurred across all the coral species in the study, illustrating the corals' compromised ability to cope with increasing temperatures.

In addition, a total of 87 volatile chemicals were detected from the two species. Surprised at the large amount, coauthor Dr Jean-Baptiste Raine said in a press release that the number was "just going to keep growing, the more we look into it and the more species we start to investigate.

Most of the chemicals identified were associated with climate regulation, so it was possible that a change in the chemical composition would affect climatic factors like the local cloud cover.

Coral stress

In terms of modelling climactic processes, Lawson speculates that the chemicals being released into the atmosphere by the corals may be a significant source that have been overlooked.

And because the presence of volatile chemicals has been known to be an indicator of illness in some animals, it is possible that the mix of chemicals released by corals may be used as a measure of coral stress and disease.

Coral communication

Lawson was also keen to explore the chemicals as a means of communication: "I get really excited about the signalling that could be happening between different species of corals, or whether they have certain smells that they'll release that might attract grazing fish if there's too much algae. Is there a certain smell that indicates corals are more vulnerable?"

"With the increasing frequency of heat stress events—and it is looking likely that bleaching will occur again in early 2021—it is even more important that we understand coral emissions as they may prove to be a key tool in our efforts to monitor and conserve coral reefs," she added. ■

SOURCES: UTS, HAKAI MAGAZINE, GLOBAL CHANGE BIOLOGY JOURNAL

FRAGMENTS OF HOPE

Environmental project restores Belize reefs

When Hurricane Iris struck southern Belize in 2001, the country's corals were decimated. Yet within a decade, a radical restoration project brought the reef back to life.

When Lisa Carne first visited Laughing Bird Caye National Park in 1994, the reef was vibrant and bursting with life, abundant with fish, corals, lobsters, crabs, sponges and sea turtles. After the hurricane, it was a scene of desolation, the seabed a swathe of rubble dotted with a few surviving corals. Hurricane Iris not only killed corals but uprooted their structure, making recovery more difficult.

For five years after Iris, the reef lay bare. Carne, having moved from California as a research assistant at the Smithsonian's field station at Carrie Bow Cay, wanted to do something about it. Her idea was to plant corals, but years were spent trying to convince potential funders. In 2006, the US-listed Caribbean acroporid corals (the Caribbean's fasted growing and primary reef-building coral) as endangered. A local funder approved Carne's proposal to restore the reef.

Carne began by transplanting 19 elkhorn coral fragments from the main barrier reef 31km away. "People were asking me why I'm going so far away for the corals," said Carne. "They thought that these corals were common, like sand. But after two weeks of mapping, I found that they were not everywhere anymore." She discovered coral cover encompassed less than 6% of the national park area, compared to 15 to 28% before the storm.

Despite a series of subsequent bleaching events, Carne noticed pockets of the reef appeared relatively healthy. As the initial 2006 transplant survival was high, she identified surviving corals and started reseeding the reefs with them in 2010.

Accelerated growth

Whereas Carne's team previously trimmed corals into 10cm pieces, grew them in a nursery until they reached around 30cm and planted them in the reef, this breakthrough allowed accelerated growth rates for certain coral species and bypassed nursery time for others completely.

Fishermen and tour guides from nearby Placencia village were the first to notice the success of transplanting efforts and offered to help with the planting. In 2013, Carne registered a non-profit community-based organization in Belize called Fragments of Hope and opened a US branch two years later. Endorsed by the Belize Fisheries Department, the organization developed a coral restoration training course, which has certified over 70 Belizeans to date.

As the only organization practising reef restoration in Belize, the group cooperates closely with the government and is now working on a joint national restoration plan for coral replenishment.

After 15 years of effort, the coral reefs at Laughing Bird Caye National Park are once again teeming with life. To date, over 85,000 corals have been planted, and fish life is once again abundant. Long-term monitoring revealed 89% survived after 14 years, much higher than usual after restoration.

Yet despite government restrictions, unchecked coastal development has decimated some of the country's mangrove cayes. "It's hard to get up every morning and do what you do when there are bigger decisions being made that you may not control," said Carne.

Techniques created by Fragments of Hope have been successfully implemented in Colombia, Jamaica and the Caribbean island of St Barts. "When we first started maybe one or two people were doing reef restoration," said Carne. "But nowadays, everybody's doing it. I joke that it's like yoga now," she added.

■ SOURCE: FRAGMENTS OF HOPE

wreck rap

A sunny winter day on Lake Mezzola, a pond located on the northern end of Lake Como. Below the surface, the water conditions are gloomy.

Text and photos by
Andrea "Murdock" Alpini
Archival photo research by
Andrea "Murdock" Alpini

Lake Como is famous worldwide for its beauty, the charm of its ancient villas, stunning lake views, iconic village of Bellagio and romantic setting. Under its surface, Lake Como hides hundreds of hidden treasures: ancient wrecks and incredible stories. One of those wrecks lies in the northern corner of the lake. Here, there is a small pond called Lake Mezzola, whose flat mirror surface hides one of the most beautiful steamships ever to have sunk along the Alps.

Plinio III Wreck

— Early 20th Century Steamship in Lake Como, Italy

MUSEO BARCA LARIANA / PUBLIC DOMAIN

A rare historical photo of the *Plinio III* sailing on Lake Como in Italy

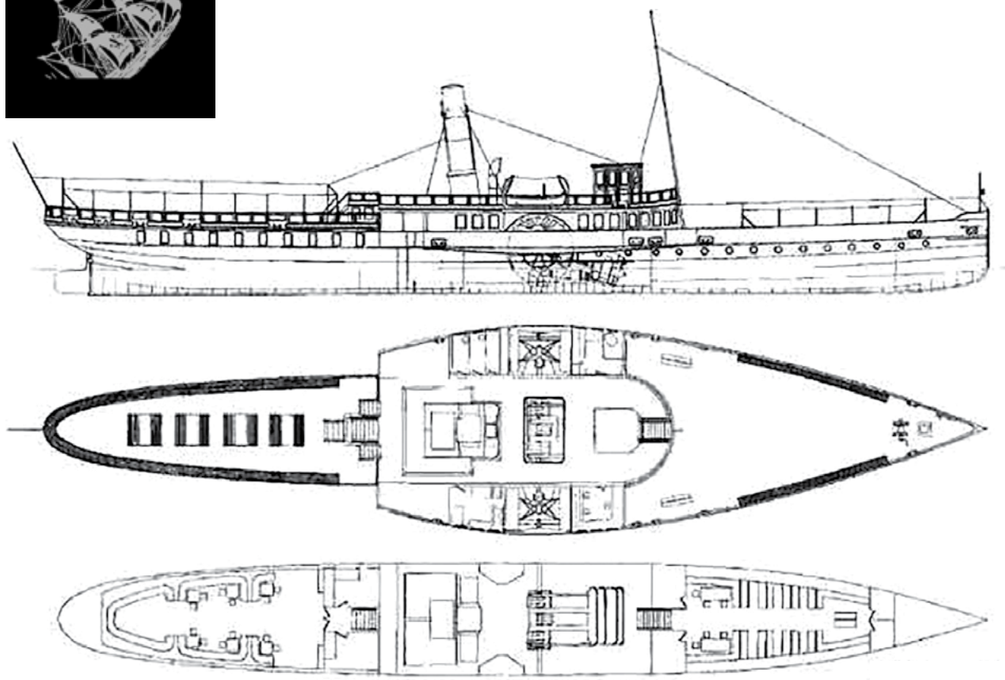
This historic steamship, which sank during a winter storm over a decade ago, was named *Plinio III* and was launched in 1903. It was the most elegant ship ever seen on the lake.

In 1902, the Compagnia Navigazione Laghi del Lario (Sailing Company of Lake Como) commissioned the Swiss shipyard Escher Wyss in Zurich to build a steamship with a gross tonnage of 750 tons, a length of 53.16m and a width of 11.5m. One year later, in the spring of 1903, the steamship was launched as *Plinio III* on Lake Como.

The elegance and refinement of the ballroom and first-class areas of the ship were well known to the local aristocracy, a mixture of British and Italian nobility. On 28 May 1927, the steamships *Plinio III* and *Piroscafo XXVIII Ottobre* were used to escort the main steamship *Piroscafo Savoia*, which was hosting the King of Italy, His Royal Highness Vittorio Emanuele III, on a lake cruise. With a cruising speed of 29km/h (or 15.6 knots), *Plinio III* was the fastest steamship on Lake Como at the time.

In August 2008, *Plinio III* received protection under the Italian Ministry of Culture. One year later, on 9 December, during a foggy and rainy winter day, the steamship disappeared in the shadows. For a decade, the wreck of this beautiful steamship has been covered in mystery and mud, lying on the bottom of Lake Mezzola.

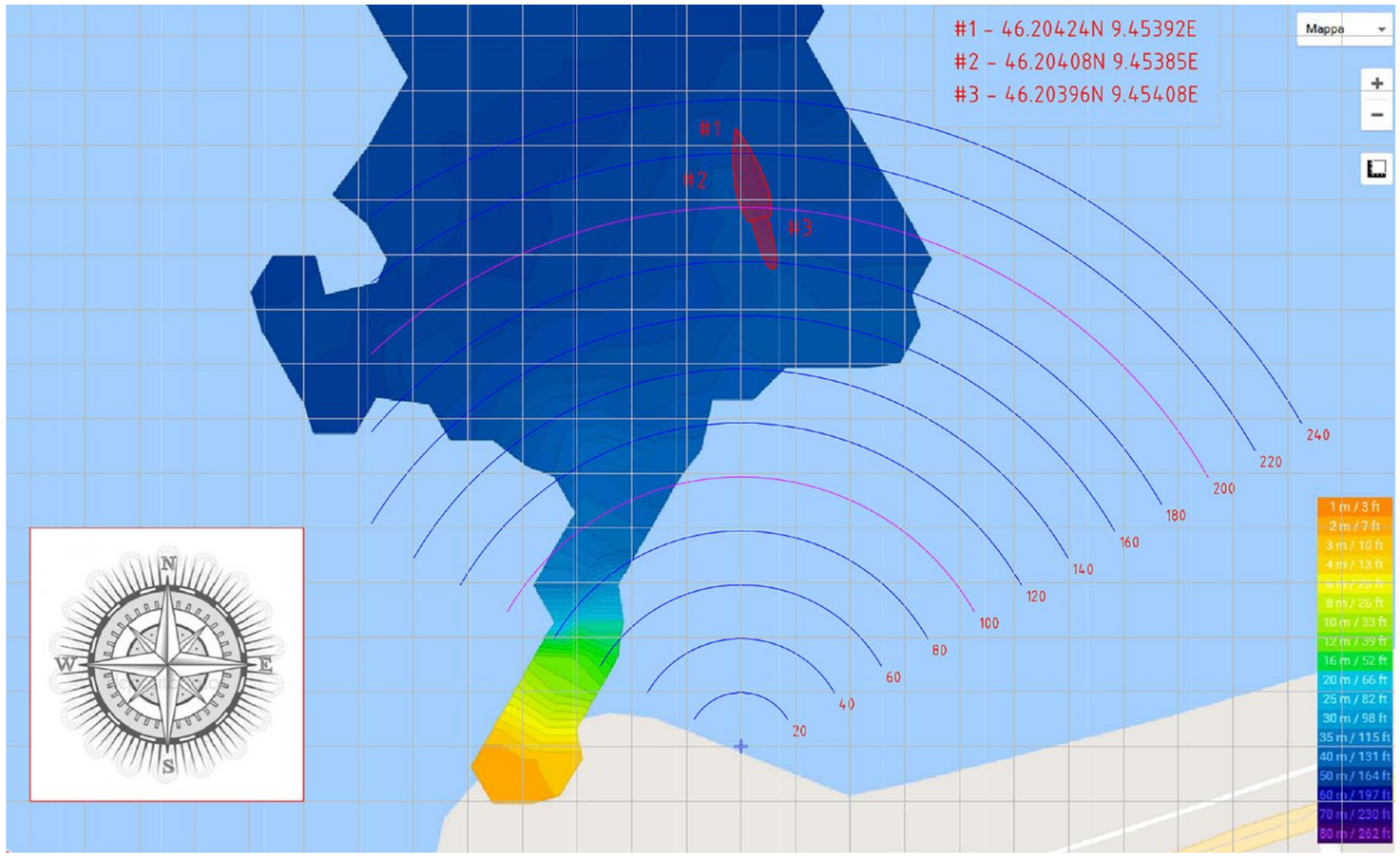
Nowadays, it rests at a depth of 45m. Very cold waters close to 4°C, extremely low visibility on the lake bottom (which may vary from 0.5m to 2m max), as well as ropes,



MUSEO BARCA LARIANA / PUBLIC DOMAIN

Archival drawings, original plans and perspectives, of the *Plinio III*

The wreck's GPS points and distance from shore (in metres). Drawing by Renato Oliva



cables and a large quantity of mud, make this wreck dive very risky but also beautiful.

Finding the wreck

There is no shot line from the surface, nor from the shore to the wreck, so the first job is finding it! Trust me, searching for the *Plinio III* is not an easy task—it is more an act of faith.

The wreck is hidden under the mud, somewhere in the middle of Lake Mezzola; you cannot see it, but you can sense it is there. One must believe it exists. So, to find the wreck and prepare to dive on it, I spent two years researching its history, location, ship plans and archival photos.

I visited the lake several times to find the wreck, with no success, until one day, with a couple of my friends, Fabrizio Pinna and Renato Oliva, we found it. We were not the first ones to dive the wreck, but a massive flood had mixed up the cards, so-to-speak, so we were playing a different game. The river emptying into the lake, with its mud and stones, had permanently changed the situation of the wreck at the lake bottom.

Diving the wreck

On the day of our first dive, we lowered a magnet, attached to a guideline, down to the wreck. It was wintertime, and the weather had turned cold, with air temperatures dropping below zero. It was sleeting and, on top of that, the wind was blowing and freezing our faces. We were cold, and the search from the surface was taking longer than expected; we spent around two hours in the water. Finally, our grappling hook found the top of the wreck.

After double-checking GPS coordinates, we decided to prepare a downline for diving. When everything was ready, Fabrizio and I started descending along the shot line until we encountered the starboard side of the *Plinio III*. Renato decided to stay at the surface in case an emergency rescue was needed. The visibility at the bottom was very poor, but it was the best we had encountered in all the dives we had done on the wreck.

Descending to the wreck

Our descent to the wreck was very slow. We did not know exactly where we were going. We supposed we were on the starboard side in the middle of the steamship, but we were not sure. While descending, we could not even see our hands. And our fins? "Did we even have legs?" I thought, laughing to myself.

My buddy and I kept very close to one another, with Fabrizio staying right beside my arm. The water was so dark, and at the same time, so milky that it was impossible to see our dive lights. Three minutes later, we approached the wreck. We could not see it, so we ended up bumping right into it.

"It's real!" I thought. "All the words I had whispered in my head about the legendary

This 3D model shows the wreck of the *Plinio III* on the bottom of Lake Mezzola and its distance from the shore (in metres). Drawing by Renato Oliva

A detail of the anchor chain on the port side of the wreck (right); An amazing view of the elegant bow of the *Plinio III* (below)

Plinio III were true!" I kept an eye on our bottom time and fixed the depth and time in my mind. We moved ahead to the bow. We were indeed on the starboard side of the wreck, close to the bridge, as I had suspected when I was still at the surface.

The exploration began. We could only clearly see around 70cm ahead, before things began to get hazy. The study of archival photos and drawings I had done now helped in recognising the parts of the wreck I was touching and could not see. The feeling I had as I was diving—rather, touching—the "glorious" *Plinio III* wreck, was the sense that it was a fine symbol of a gilded age.

Starboard side

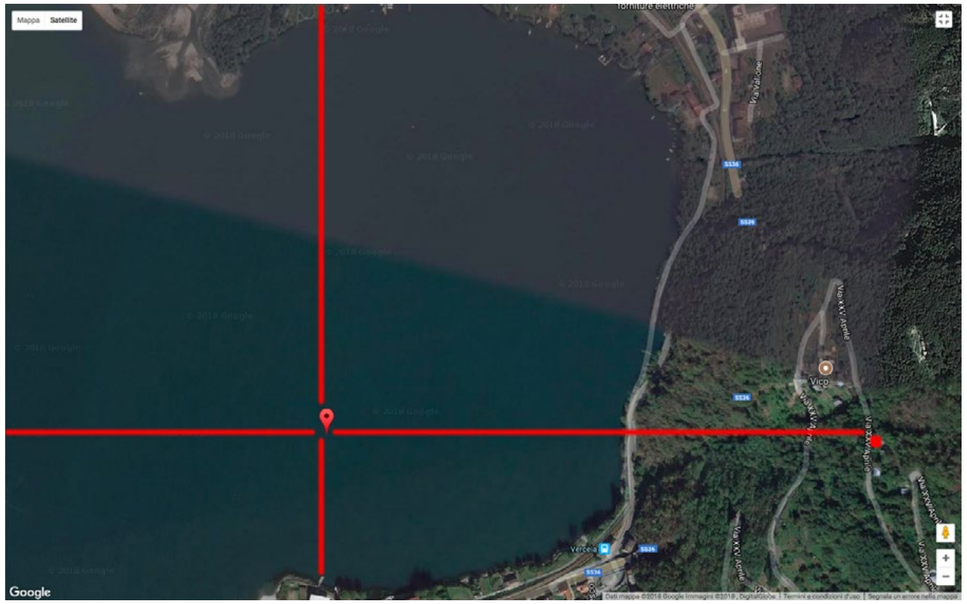
We moved slowly along the starboard side of the deck, moving our fins in slow motion so as not to stir up the silt lying on the wreck. We encountered a bollard and, a few metres farther, a hawsehole, with its steel chain. The anchor was hidden somewhere in the dark muddy bottom of Lake Mezzola.

At the end of our moon walk, we met the razor edge of the bow. "Wow!" I was breathless. It was a pure design belonging to nineteenth-century naval architecture. Awesome. We took our hands off of the wreck just for a minute, as we swam backwards a few metres in order to admire this piece of art, sunken in the gloomy lake.

Port side

We moved ahead to the opposite side, the port side. When we reached the centre of the steamship, we found the name "PLINIO" on its side. It was not painted; the sign was engraved in metal. Marvelous. Being in front of it, looking at the ship's name, gave me a great, positive feeling, in spite of the darkness that surrounded us. Fabrizio and I exchanged glances, and we decided to move a bit deeper. We knew that, below the sign, we would find the first of the two steam paddlewheels that

wreck rap



Location of the wreck on Google Maps (right). Drawing by Andrea Murdock Alpini; The ship's name "PLINIO" appears in the milky water (far right); The parapets of the stern section of the *Plinio III* (below)

comprised the core of the engine propulsion system of the ship.

The stern

A series of portholes ran to our left. The stern was partially collapsed, especially the blue tented awning above it. This part of the wreck was very fragmented and precarious. On the blue awning, a soft layer of 70 to 100cm of mud was just waiting to fall down. We had to move slowly. The wreck was damaged, and some spikes arose from the deck. The *Plinio III* appeared not be very friendly to its visitors here.

We rounded the stern and were once again on the starboard side of this glorious steamship. Twenty-five metres, more or less, were left in the distance to our starting point. We moved forward slowly. Across the main deck, in the middle of the ship, there was the entrance to the ballroom. Getting inside would be a dream, but it could quickly turn into a nightmare for us. Bad visibility here was an obstacle; we had to make our choices carefully.

Command deck

Again, we decided to decline the invitation, and moved on. For the second time, we reached the paddlewheel blades and the ship's name "PLINIO" engraved on the starboard side of the hull. Five minutes of bottom time remained. We had already spent 25 minutes on the wreck; five more, and our time would be up. Fabrizio and I decided to visit the command deck on the upper level. Here, the same ropes and cables surrounded the bridge and the funnel. We pointed our dive lights into a window. Eternal nothingness. It was too dark to see anything inside.

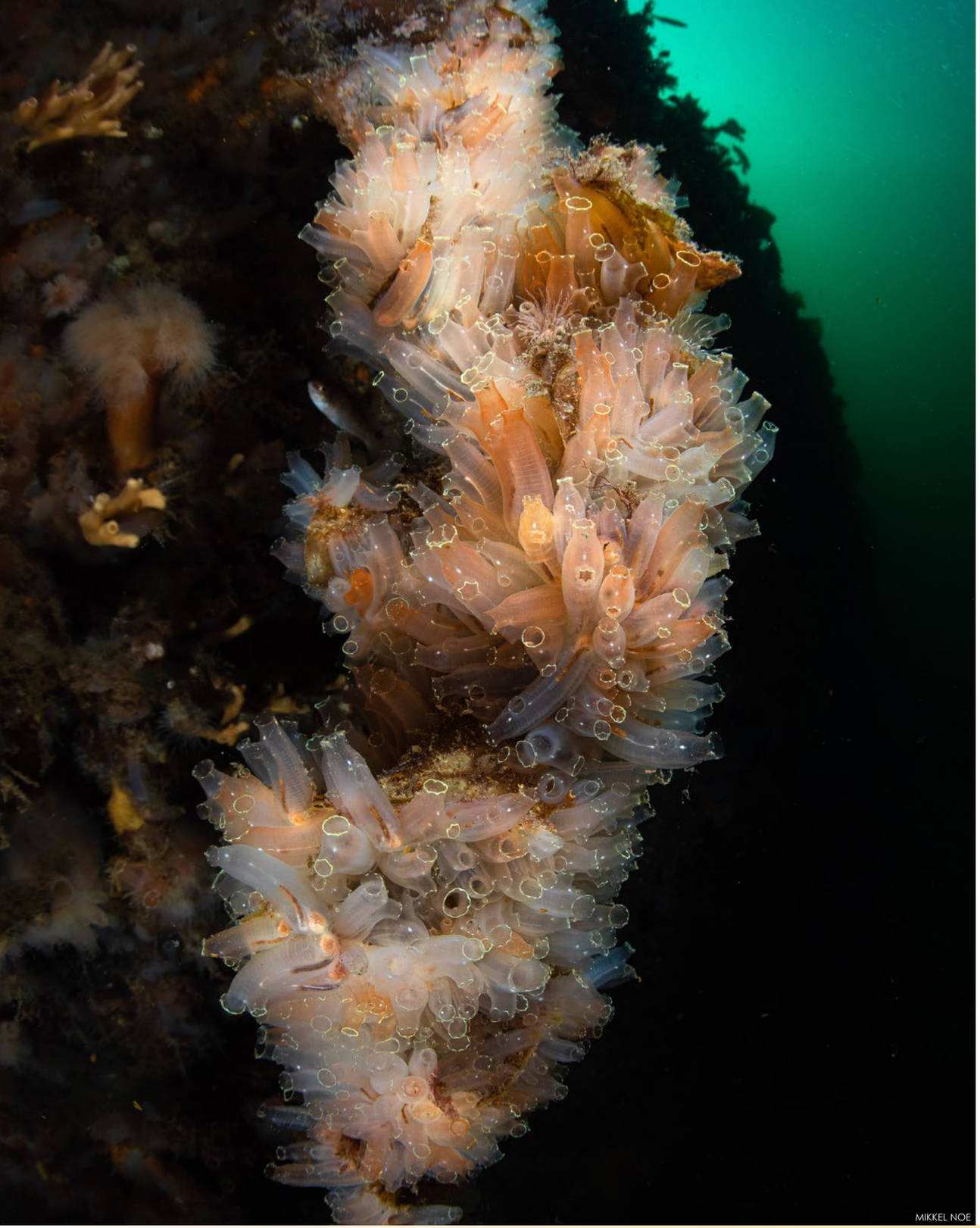
When our bottom time struck the thirtieth minute, we quickly switched our focus to our decompression procedure. Once we were back at the surface, still breathing from our regulators, we shouted with joy. Today, we had reached the wreck, and we enjoyed the great adventure together as a team.

Afterthoughts

Diving the *Plinio III* is an act of faith, an incredible place of mind, where one's emotions and the blood running in one's veins merge into an illusionistic moment. The experience is unreal! ■

The team's sponsors include PHY Diving Equipment, Scubatec, Tecnodive Booster, Big Blue Lights, TEMC Gas Analyzers, and Museo Barca Lariana.

Based in Italy, author Andrea "Murdock" Alpini is a technical diving instructor for TDI, CMAS and ADIP. Diving since 1997, he is a professional diver focused on advanced trimix deep diving, log dives with open circuit, decompression studies, and research on wrecks, mines and caves. Diving uncommon spots and arranging dive expeditions, he shoots footage of wrecks and writes presentations for conferences and articles for dive publications and websites such as ScubaPortal, Relitti in Liguria, Nautica Report, ScubaZone, Ocean4Future, InDepth *and* X-Ray Mag. *He is also a member of the Historical Diving Society Italy (HDSI), and holds a master's degree in architecture and an MBA in economics of arts. He is the founder of PHY Diving Equipment (**phidiving.com**), which specialises in undergarments for diving, as well as drysuits, hoods and tools for cave and wreck diving. Among other wrecks, he has dived the Scapa Flow wrecks heritage, Malin Head's wrecks and the HMHS Britannic (-118m), Fw58C (-110m), SS Nina (-115m), Motonave Viminale (-108m), SS Marsala (-105m), UJ-2208 (-108m) and the submarine U-455 (-119m)—always on an open circuit system. His first book (in Italian),* Deep Blue, *about scuba diving exploration was released in January 2020 (see **amazon.it**). For more information on courses, expeditions and dived wrecks, please visit: **wreckdiving.it**.*



MIKKEL NOE

Welcome to Denmark

We have more than 7,300km (4,536mi) of coastline here in Denmark, so no matter where you are in our country, the sea is not far away.

We have it all—well, almost everything—when it comes to diving in and around Denmark. We have dives from the shore almost everywhere, and we have a huge number of wrecks dating back more than 200 years. It is even still possible to see some remains left from the wars against Britain that took place in the early 1800s. We have wrecks from WWI and WWII, and many of them are still in rather good condition. We also have vessels that were sunk to create artificial reefs, after having been prepared and made safe for divers.

We have more than 150 local dive clubs, and most of them not only support scuba diving but also spearfishing, freediving (apnea), underwater rugby and snorkel training for kids—there are many activities, all driven by volunteers and people with a great passion for all that goes on under the water's surface.

I am quite confident that if you bring your own gear and contact a local dive club, they will help you with good advice on where to go, and maybe even bring you along on their next dive trip. However, if you and your dive buddy are here for a few days and just want to dive on your own, we also have quite a few dive centres that offer gear rental and will help you go diving.

Please be advised that the water temperatures around Denmark are on the cold side. In the summer, we might reach 20°C at the surface, and some people may immediately say that this is too cold.

Indeed, this is what we often hear from Danish divers who get their dive certifications in crystal-clear tropical waters. They ask, "Can you dive in Denmark?" Yes, you most certainly can, and it's amazing! Especially when the visibility is good, the sea is calm, and the sun is shining, there is a very good chance that you will see a wide range of diverse marine life.

Even though we have a lot of coastline, it is not always the case that we can shore dive in certain places along the coast where there are some restrictions in place, either by nature itself, or because of harbours, or other installations, and not least because of the water depth. As you probably know, we have no mountains in Denmark—only a couple of hills—and it is the same for the surrounding coastline. It is flat, and one must often walk or swim some distance, in very shallow waters, to get to a depth in which one can call it a dive. That is why many dives are done by boat.

Fortunately, we have some very good spots that are reachable from the coast. On a good day, there are often many people at these sites, and Danish divers are normally quite happy and more than willing to help you find a good diving experience when you are here.

So, if you are going to Denmark—whether it is for a holiday, studying, working or something else—then bring your dive gear, join a local club and get some great experiences underwater as well as above. Divers are normally a very social lot, and it is rare that a good dive—or a day of diving—is not ended with a nice chat over a cup of coffee, or maybe something stronger. But the most important thing is that we all come out of the water safe and sound—and if the visibility is bad on one day, then we just go and try again on another day.

Welcome to Denmark. We hope that you will have a great time here—stay safe and enjoy the diving.

Best regards,

Jesper Risløv
President of the
Danish Sportdiving
Federation

The Nature of Diving in Denmark

Text and photos by Peter Symes

Much more than the Little Mermaid, Hans Christian Andersen & Lego...

Along the coasts and in the seas around Denmark, a wide variety of species and types of habitats can be found. Most of the Danish waters are shallow, with only a few areas beyond the reach of recreational divers.

Technical diving skills can add range and bottom time, as well as provide added margins of safety, but they are not a requirement for most dives. Essentially, the seas are a submerged landscape that stretches from the brackish waters of the Baltic, over the straits between the main islands to Kattegat and Skagerrak, and on to the North Sea, which has almost the same salinity as the oceans.

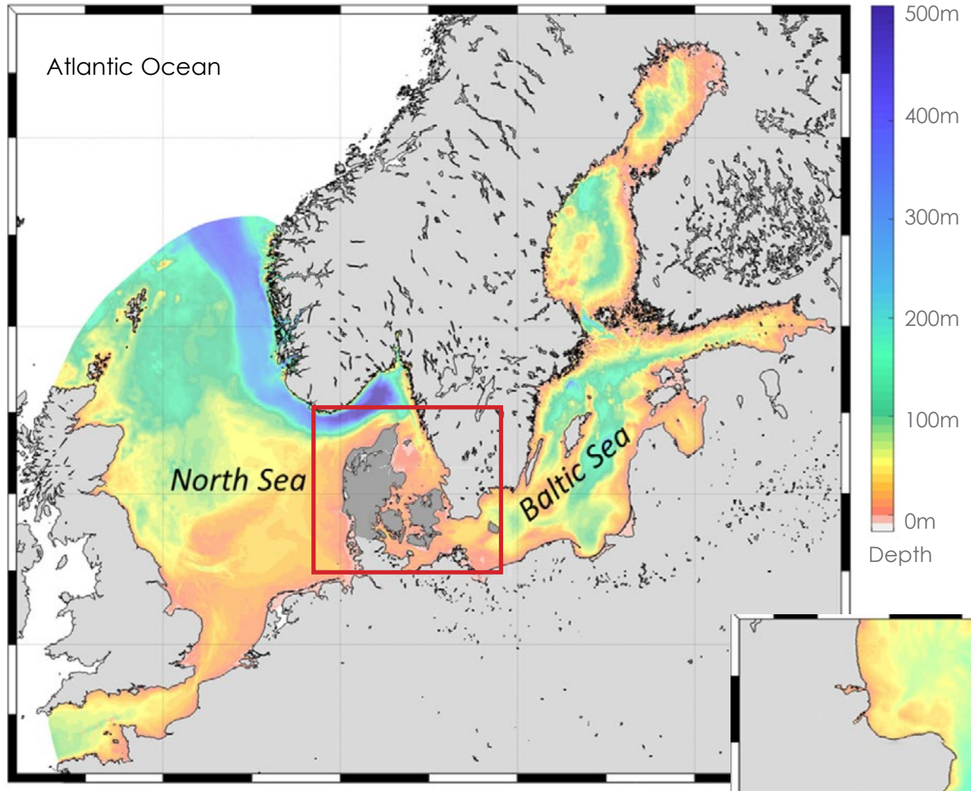
Most parts of the seabed are soft, composed of sand or mud, but there are also extensive areas with a hard bottom made of gravel and pebbles, and what are locally called stone reefs, as well as some unique "bubbling reefs," which are vertical sandstone structures formed by bacteria utilising methane gasses seeping up from deposits deep underground.

Due to the marked differences in salinity, which is significantly lower south of the Danish straits, there is also a pronounced difference in habitats and species across the waters, most notably along the north-south axis, which is the direction of water flows and the overall salinity gradient. Biodiversity is generally the highest in areas with the biggest salt content, whereas wrecks are much better preserved in areas where salinity is low. Once past the Danish straits and into the Baltic, the salinity drops and steadily decreases, eventually transitioning into brackish water with low biodiversity.

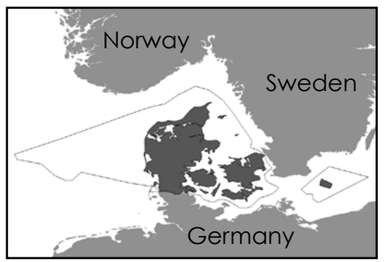
The Danish archipelago is a convoluted mosaic of islands, fjords, bays, inlets, estuaries and straits connecting the main bodies of water. Despite being only 368km (229mi) from the northernmost point to the southernmost, the country's coastline is officially 8,754km long. There are 443 named islands and 1,419 islands bigger than 100m^2. In other words, one can nearly always find an alternate dive location nearby if the first one blows out.

Denmark does not offer much of an integrated hospitality-and-dive industry in which accommodation, meals and diving are offered as a combined package by an operator, but many of the larger dive centres will coordinate or have deals with nearby hotels, holiday homes or summerhouse rental bureaus. And fine dining, including 25 Michelin-star restaurants, can be found not far away in cities and towns across the country.

Diving takes place all year, but activities are markedly lower during winter for obvious reasons; it is much colder, and the days are short and often murky. That said, winter and spring diving often rewards those who choose to venture out while the water is cool and therefore has very little or no algae, resulting in excellent visibility. Summers tend to be quite lovely, with pleasant temperatures above and under water, as well as long days and evenings with white nights around midsummer. During summer, there is no other place I would rather be.



Denmark sits at a choke point between the Baltic and the Atlantic, and the Danish straits are major shipping lanes.



Denmark's waters, or Exclusive Economic Zone (EEZ), comprise two seperate areas; The smaller one in the Baltic surrounds the island of Bornholm.

The key to appreciating the nature and distinct qualities of Danish dive sites and diving is understanding how the bottom profile forms a saddle point going across the Danish straits in an east-west direction. This ridge or shallow plateau divides the seas into waters of significantly different salinity, and as a result, also into different types of biotopes.

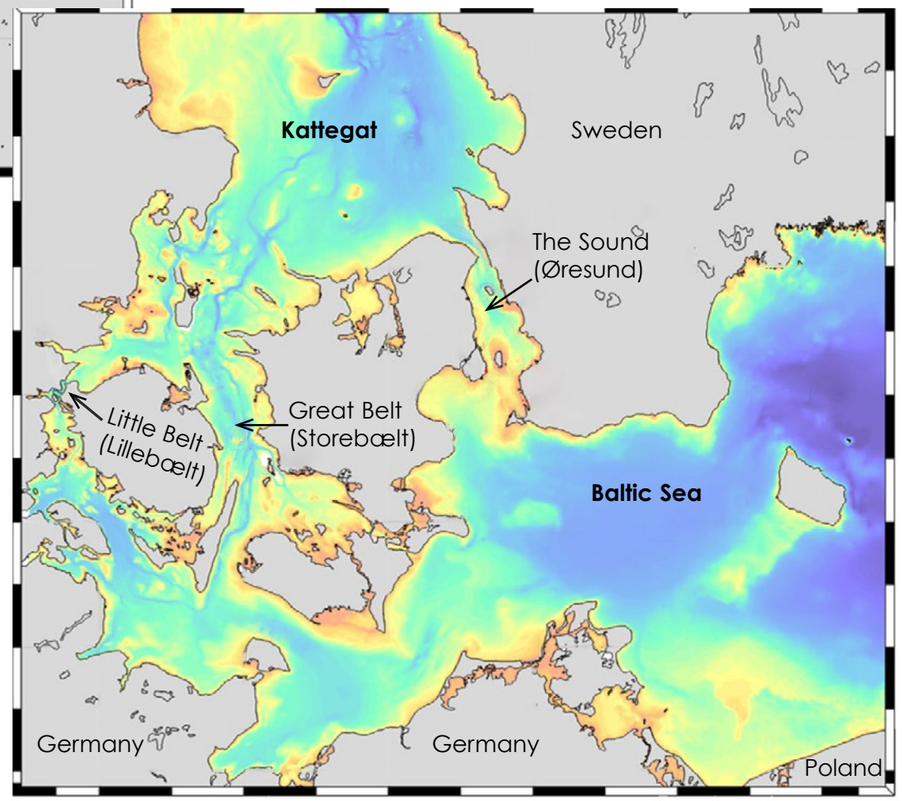
The three straits are named Øresund, Store Bælt and Lille Bælt (The Sound, Great Belt and Little Belt, respectively). The former two are busy shipping lanes connecting the Baltic Sea to the North Sea and Atlantic Ocean.

South of the straits

South of the straits, we find the Baltic Sea, which is brackish. It was a freshwater lake, called the Ancylus Lake, only 8,000 years ago, and there is a continuous inflow of freshwater from groundwater, rivers and streams in its catchment area in Northeast Europe. The Baltic discharges through the Danish straits adjoining the North Sea; however, the flow is stratified and complex.

Because fresh and brackish water is less dense than oceanic seawater, as the Baltic water flows out, northwards, it does so on top of the saltier oceanic water, which creeps along the bottom in the opposite direction, wedging underneath in a southbound direction.

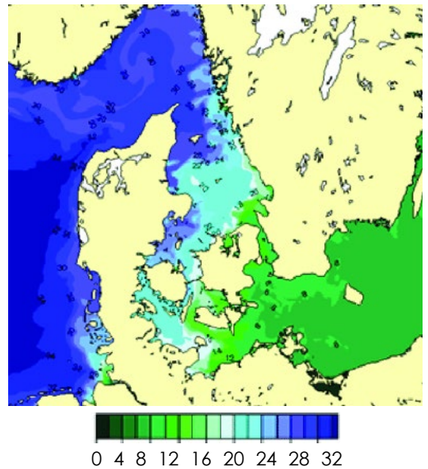
The straits are not just horizontal constrictions, they are also shallow, except for some winding deep-water channels, which serve as shipping lanes. This is where land bridges, not too long ago, separated the freshwater lake from the ocean and made southern Sweden contiguous with Central Europe.



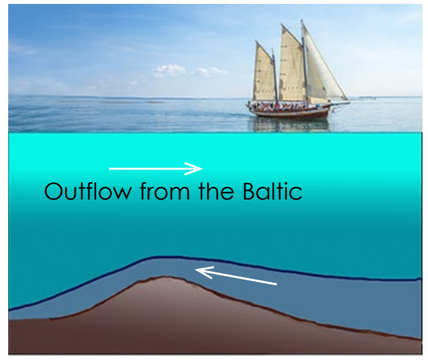
Depth chart showing the straits, lower Kattegat and the Western Baltic. Most of the seabed within Danish waters lies within reach of recreational diving. Deeper locations are mainly found in the Baltic, and there are some in the middle of Kattegat.

As a result, the bottom profile of the straits constitutes thresholds, akin to a tall doorstep on the seabed, which obstructs deeper layers from flowing over and into the Baltic—not entirely, but to quite a limited extent. The significance of this inflow of salty water is, among other things, that it brings oxygen to the deeper layers of the Baltic, which are otherwise quite depleted.

Denmark



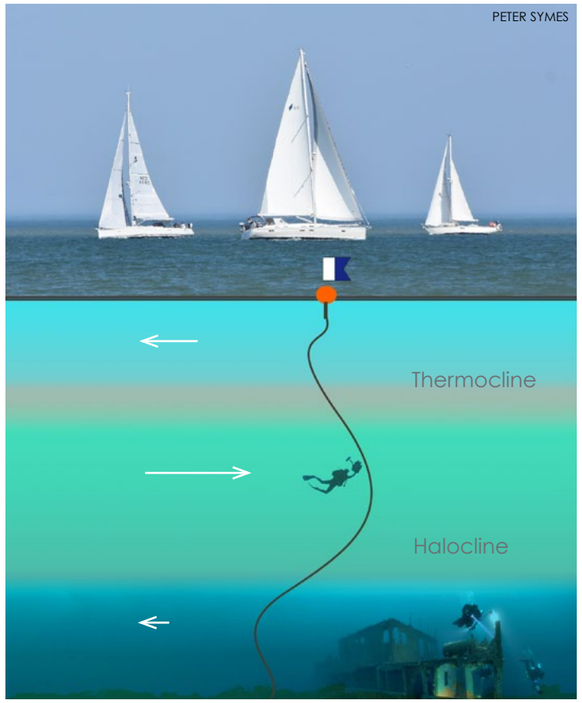
Salinity profile in promille salt content. Salinity drops markedly south of the Danish straits, which act as thresholds over which the salty and denser water from the north, only to a lesser degree, is able to creep over. See figure below.

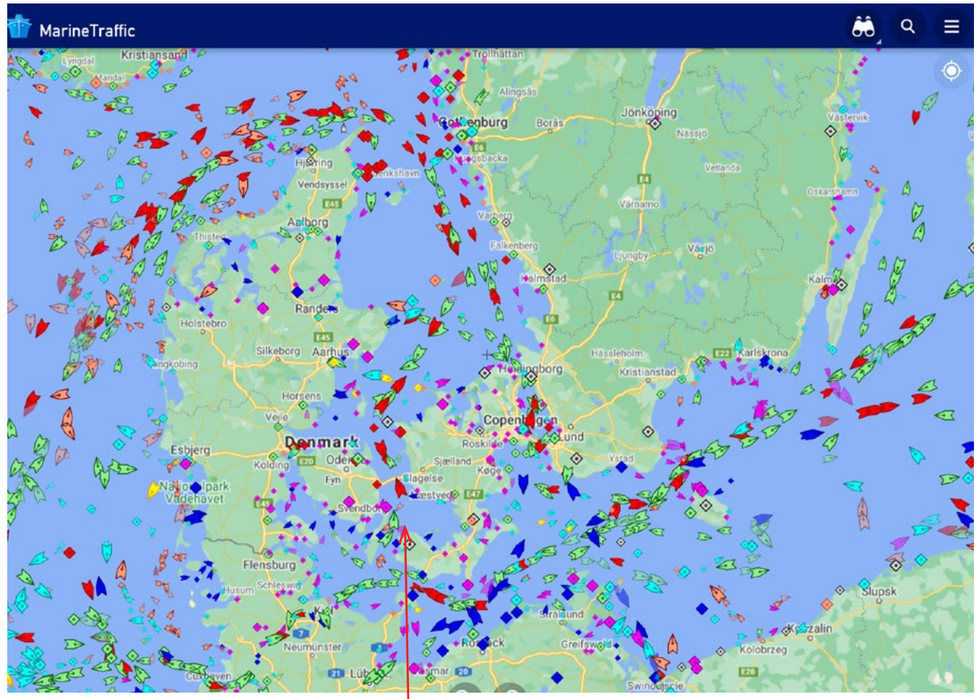


South of the straits, biodiversity drops significantly because far less species live, or can even survive, in brackish water than in fresh or saltwater.

On the other hand, because salinity is low, wrecks are much better preserved, which is also due in part because shipworm, which devours timber, cannot thrive here. So, old wooden wrecks, often many centuries old, remain well preserved on the bottom.

Bottom topography, salinity & currents





In recent years, often when transects are done prior to laying down cables or pipelines, several medieval shipwrecks have been discovered with their rigging still intact. The *Vasa*, now on display in its own museum in Stockholm, is arguably the most famous example of a perfectly preserved warship from the 17th century. Steel ships also suffer much less corrosion and remain intact for a much longer time thanks to the same low salinity as well as lack of oxygen in the Baltic Sea.

North of the straits

North of the straits, in between the peninsular part of Denmark called Jutland, and the Swedish west coast, we have a body of water known as Kattegat, which is saline, just slightly less than the ocean.

Hold on to the downline, and your camera! At times, divers may have to descend and ascend though a water column that is stratified into three layers seperated by a thermocline and a halocline. Each layer may have currents that run in different directions and strengths. Below the halocline, the visibility is often much better because the water is cool and devoid of algae.

Here, we find the usual complement of saltwater flora and fauna.

This salty water, being denser than the water in the Baltic, flows south along the bottom, underneath the outflowing brackish water from the Baltic, often resulting in a strata of currents going in different directions at different depths.

It is predominantly in the three straits that we find the best and most diverse dive sites, and surely the most popular. This is down to two main factors. Firstly, the straits have been the main shipping lanes between the Baltic and the Atlantic for centuries, if not millennia, so this is obviously also where many shipwrecks have occurred. The Danish waters are littered with them, including modern vessels, warships and planes from WWII, warships from WWI and earlier, tall ships and cargo vessels, Hanseatic kogges and Dutch flutes, Viking ships and canoes from all the way back to the Stone Age. There are tens of thousands of registered locations, but, granted, that count includes wrecks of which there is now barely anything left to see.

The second reason is the current, which in places—most notably in Lille Bælt (Little Belt), which is arguably the area with the best dive sites in the country—carves out steep banks and drop-offs close enough to the beach that you can just walk out from the coast and dive to, say, a depth 40m without much of a swim. We will get back to that in more detail in the following stories.

Where there are currents, there are also nutrients, and consequently, thriving life, and the banks along the straits or stone reefs often display prolific life. ■

Screenshot from the app MarineTraffic (available for both Android and iOS), showing shipping traffic moving through Danish waters

Mind heavy shipping in the southern part of the Great Belt. Large ships travel in the deep-water channel, which is quite narrow in some places. Divers head out to one of the many wrecks that lie along this channel, and in some cases, right in the middle of it—such as the WWII German destroyer M36, which is described later in a following story. This location is one of the more extreme, in regard to shipping. In most cases, dive sites are not so close to shipping lanes.

Free app forecasts currents

The Danish Maritime Authority has created an app that is simply a brilliant tool for divers.

It is called Sejladsudsigt, which roughly translates into "Forecast for Sailing." It is available for iPhone, iPad and Android.

It comes with a fascinating and most useful feature forecasting the currents, even at different depths. The screenshots below show you how it looks.

The interface and menu system are also in English. All one has to do is select a region and pick a depth, and then the app displays colour-coded graphs depicting the predicted strength and direction of currents, which may be different at different depths.

The information is also available on a website: **https://ifm.fcoo.dk**

So, now one can know what to expect in advance and prepare accordingly for a planned dive. ■

Denmark: General Overview

Skagerak

The Skagerrak is between 80 and 140km wide. It deepens towards the Norwegian coast, reaching over 700m at the Norwegian Trench. Near the Danish coast, a belt up to 50km wide comprises sandy, gravelly or stony bottom at up to 50m depth. This sea is much exposed to wind and wave action. The most famous wreck here is the ferry M/S *Skagerak,* which went down in 1966 without loss of life. Now it lies upside down at a depth of 25m.

Skagen

At the tip of Denmark, where Kattegat and Skagerak meet, currents clash and shoals keep shifting. Exposed to storms and waves from the North Sea and the Atlantic, these treacherous waters have caused a lot of shipwrecks over time and now offer some of the best wreck diving in the country. The prevalence of choppy seas makes planning uncertain and diving often challenging.

Kattegat

Parts in the middle are deep. It has assorted wrecks and reefs with life. Areas around the islands of Læsø and Anholt are shallow with shoals. Both islands are quite a way out. Big seal colonies can be seen on the islands' beaches.

North Sea

The Danish west coast slopes very gently; For every kilometre, it only gets 1m deeper. Lots of tall ships have foundered here by being blown toward shore in storms and grounding on sand bars. Little remains of these wrecks because the surf grinds them down. Wide beaches with surf make entry challenging. Farther out, however, there are mighty warships from the **Battle of Jutland** the largest naval battle of WWI.

Øresund

The Sound is the second busiest shipping lane. With low to moderate depths, it has many good wrecks, including a number of tall ships stemming from 16th, 17th and 18th century naval battles, some still with cannons present.

Lillebælt

(**Little Belt**) is the narrowest of the three straits. It is generally considered the best area to dive because locations have lots of biodiversity and can easily be accessed from the beach.

Fehmarn Sound

Moderate depth; many good wrecks.

Østersøen

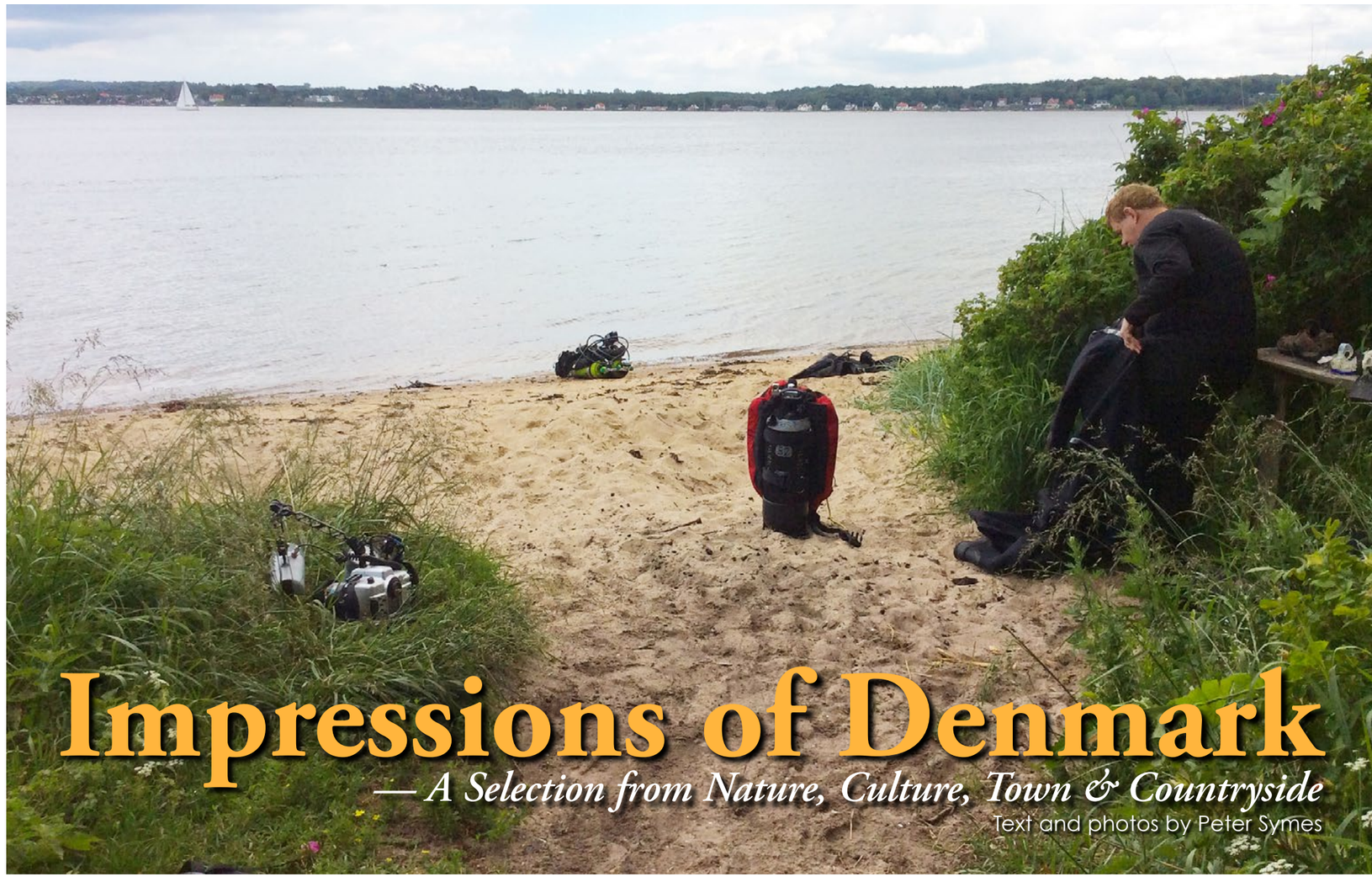
a.k.a. **The Baltic Sea**, or more specifically, the southwestern part of it. Because of the low salinity, wrecks are much better preserved in these waters. It is also here we find the greatest depths, which technical divers can explore. The island of Bornholm sits by itself, east of the rest of Denmark and south of Sweden. It is the only part of the country that has rocks, which makes for a different type of diving. The island is a popular holiday destination.

Storebælt

The Great Belt and its southern extension, **Langeland's Belt**, are shipping lanes littered with wrecks. There are also nice patches with reefs and lots of sea life. Also, the bridge pillars, which are covered with sessile life, are popular dive sites. Currents can be ripping, so fun drift dives can be had.

Sydfynske Øhav

(South Funen Archipelago) is a picturesque area with many small islands and plenty of marinas, making it a favourite among boaters. The area is relatively shallow and easy to dive. There are some good wrecks, including the artificial reef M/F *Ærøsund*, as well as Stone Age settlements.



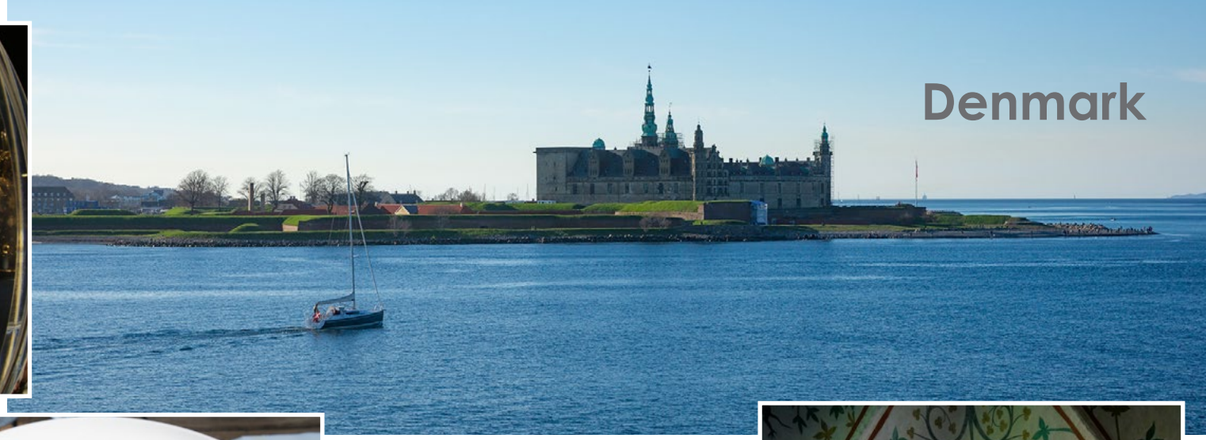
Impressions of Denmark

— A Selection from Nature, Culture, Town & Countryside

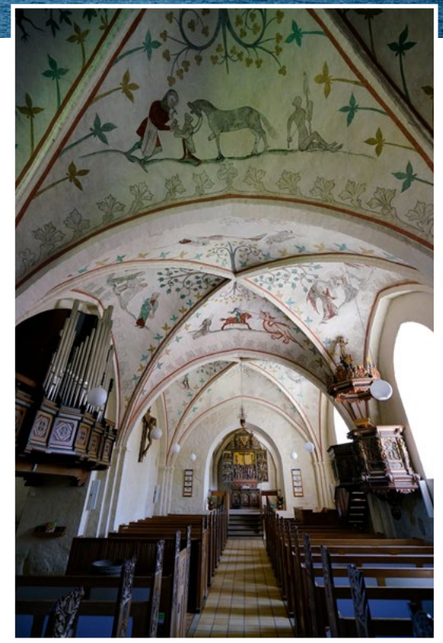
Text and photos by Peter Symes

CLOCKWISE FROM TOP LEFT: Heather fields by the beach in Rørvig on the island of Zealand; Winter evening at Nyhavn in Copenhagen; Wildflower; Supermoon and thatched-roof cottage, Rørvig; Preparing dive gear and underwater cameras for a dive in Little Belt, Jutland; Folks hang out on the bridge that crosses the ring lakes in Copenhagen; A swan cygnet naps in the embrace of its mother; Wild anemone flowers, which only bloom for a couple weeks in springtime, creating carpets of flowers like snow in the forests around Zealand

Denmark



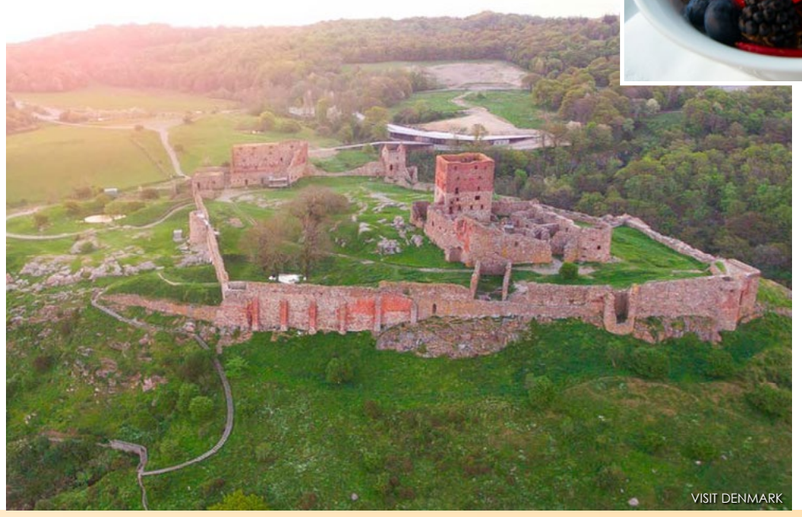
Kronborg Castle guards the narrowest point of Øresund (above); Medieval frescos in a village church (right); Crown jewels on display at Rosenborg Castle (top center)



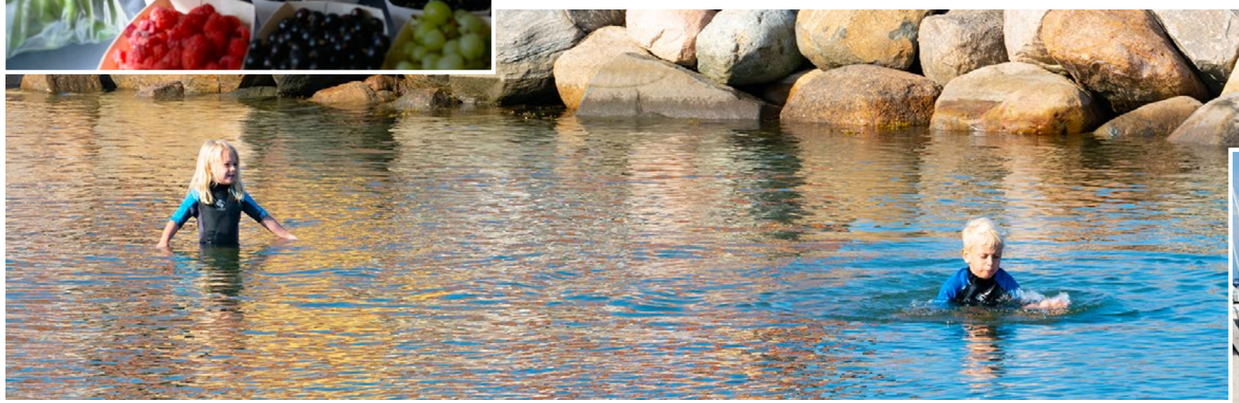
Many Copenhageners commute by bicycle (above); The Sun Chariot, Early Bronze Age, ca.1400 BC (above inset); Medieval ruins of Hammershus on the island of Bornholm in the Baltic Sea (below)

Nothing beats a great meal made from local produce after a day of diving, cycling or just walking the city. In recent years, countless good eateries have popped up everywhere.

Jazzhouse Montmartre in Copenhagen is one of the best jazz venues in Europe (above); The northern tip of Denmark where two seas meet (center left); Copenhagen's old neighbourhoods have been restored (top left).



Frederiksborg Castle, noted for its towers and turrets, is one of the finest examples of Renaissance architecture. It is now a museum open to the general public.



On a large area of moorland, which is now protected, the "king stone" in Odsherrred marks the spot where Harald Bluetooth was elected king of Denmark in 1076 (above); A good place for fossil hunting, Møns Klint is a stretch of chalk cliffs along the southern coast of Denmark (top left); The beach at Rørvig, on the northern coast of Zealand (right)

THIS PAGE: The many sheltered waters and bays in Denmark make it an optimal place to holiday with family. Fishing for crabs never gets old. The blue contraption (top) is a race track for crabs being released back into the sea. Even at mid-summer, one can find beautiful beaches and sand dunes, which are not one bit crowded. After a good day at the beach or in the marina, why not pick up some fresh local produce from a few of the roadside stalls or farms? Or you can hang out at the marina and enjoy seafood barbeque in the long summer evenings. During summer, many good concerts also take place in the recreational areas in the countryside and resorts along the coast.

Seafood barbeque in Rørvig Havn (harbour). The restaurant is right next to a shop with fresh and smoked fish; Beth Hart performs in Tivoli Gardens (top right).

The popular canalside cafés and restaurants of charming historic Nyhavn at sunset in the center of Copenhagen, the capital city of Denmark

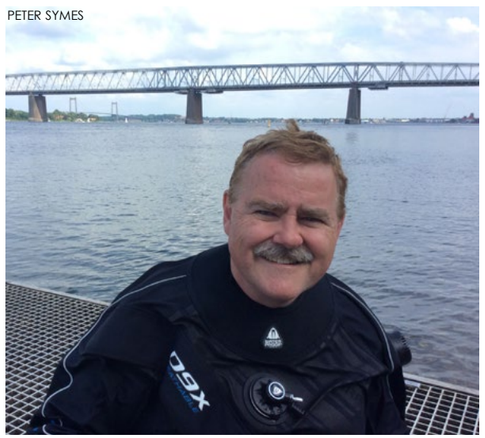
SCOTT BENNETT

Diving & Dining in Denmark — A Foreigner's Perspective

Text by Scott Bennett. Photos by Scott Bennett, Lars Stenholt Kirkegaard and Peter Symes

"We're going to *Middelfart*??" Now there was a name to draw out my inner 8-year-old. It's funny because it has "fart" in it! Chuckles over and composure regained, my interest was piqued. Having been sidelined earlier in the year due to an unexpected health issue, I was eager for a dive trip. When *X-Ray Mag's* editor-in-chief, Peter Symes, suggested his home turf of Denmark, I was a bit hesitant. As someone weaned on the tropics, the country does not exactly leap to mind as a dive destination. After all, isn't diving all about coral reefs overflowing with colourful reef fish? What could possibly entice me to dive in water cold enough to transform my fingers into arthritic claws?

PETER SYMES



Canadian author and associate editor Scott Bennett learnt to dive in a drysuit in Denmark and is seen here with the Old Little Belt Bridge.

I had visited Copenhagen before, but had never been outside the city, let alone dive. Located 209km (130mi) west of Copenhagen in the central part of Denmark, Middelfart is situated at the western end of the island of Funen, just across the Lillebælt (Little Belt), the channel separating it from the peninsula of Jutland. With an area of 3,099.7 sq km, Funen (or "Fyn" as it is known in Denmark) is the country's third-largest island.

Nothing to do with flatulence, the name "Middelfart" is derived from the Old Danish terms *mæthal* (middle) and *far* (way), referring to the Snævringen Strait, Little Belt's narrowest section. It is also renowned as one of Denmark's prime diving locations, attracting not only residents but visitors from neighbouring Germany and the Netherlands. I would soon discover it to be a very different kind of dive experience.

After a day to recover from jetlag, it was time to get ready. Peter managed to borrow a trailer to tow behind his car. Loading it with dive gear and luggage was a major undertaking. I had doubts as to whether the car could even pull it! Happily, the car managed, and we set out for the three-hour drive to Middelfart. Best of all: no worries about airport check-ins or excess baggage charges.

The journey

Getting there required a traverse

Middelfart


SCOTT BENNETT


SCOTT BENNETT

The city is also famous for its many iconic spires, such as the dragon spire of the 17th-century stock exchange Børsen (left) and the Neo-Baroque spire of St. Nicholas Church (right), which now houses the Nikolaj Contemporary Art Center.

Copenhagen is famous for its many bicycles, gathered in front of cafés where locals enjoy dining outdoors, even in colder months, wrapped up in blankets provided by the many cozy cafés such as Skildpadden (The Turtle) dotting the small streets of the old historic center (left); Colourful poppies and wildflowers dot the green fields of the Danish countryside (right)


SCOTT BENNETT


PETER SYMES


PETER SYMES

of the Danish archipelago. Of the 443 islands, we had to cross two. Departing Copenhagen's bustle, we soon entered the green of the Danish countryside. Dotted with numerous farms, it looked remarkably like rural Ontario, my home province in Canada.

We then passed over the Great Belt Bridge connecting the big islands of Zealand and Fyn, an engineering marvel that was the largest construction project in Danish history. Encompassing a road suspension bridge and a railway tunnel between Zealand and the small island Sprogø, located in the middle of the Great Belt, and a box girder bridge for both road and rail traffic from Sprogø to Fyn, the suspension bridge features the world's third longest main span (1.6km or 1mi) and is the longest outside Asia. Prior to opening to road traffic in 1998, the only way across from Copenhagen was by ferry.


Odense

Diving 2000

Enroute to Middelfart, we stopped in the city of Odense to visit the dive center Diving 2000 where we picked up tanks and gear. Odense is famous as the birthplace of Hans Christian Anderson, and the city has many reminders of this distinction for the visitor. Despite spending most of his life in Copenhagen, both cities tussle over ownership of Denmark's most famous literary son.

On hand to meet us at the dive center was owner Jan Laurenborg Olsen, who promptly fitted me with a shell and the latest Waterproof drysuit. Very snazzy indeed! We also picked up some tanks and added them to our already packed trailer. I was amazed the car could pull it all.

Lodging

After another hour, we finally arrived at Middelfart. Our home for the week was the Fænø-Sund Conference Center, a sprawling complex of identical yellow bungalows occupying a waterside location just outside of town. Our cottage was bright and spacious, with two bedrooms and bathroom, a living room, kitchen and outdoor patio—sort of like an Ikea cottage, with white walls and black furnishings. The spacious back courtyard was promptly occupied with our mountain of dive gear. Arriving on the cusp of the school holiday season, the resort was not yet full.

By the time everything was unpacked, it was getting past dinner time, so we headed into town to see what was open. Not a lot, as it turned out. Fortunately, Café Jazz, situated right on the waterfront was open, but we had to order fast. We all enjoyed a tasty smoked salmon salad as the sun set behind the Old Little Belt Bridge.

PETER SYMES

Jan Laurenborg Olsen (center) is the owner of Diving 2000 dive center in Odense (above).

Henne Kirkeby

Henne Kirkeby Kro, Chef Paul Cunningham's Michelin-star restaurant on the western coast of Jutland (top left), is styled with the clean lines of Danish décor, accented with delicate floral arrangements.

LEFT TO RIGHT: Quail's egg-topped beef tartare and tartlets (once served to the Queen, according to the chef); salad of green, cherry and heirloom tomatoes from the inn's garden; braised cod with fresh peas and Danish new potatoes; flying gurnard fish and chips; Danish cheeses; and a strawberry-rhubarb compote with mascarpone ice cream for dessert

Culinary adventure

The next day began with a culinary adventure: lunch at a Michelin-star restaurant. Our reservation was for noon (the only available spot for days) and the drive just over an hour. Being a serious foodie, my anticipation was off the charts.

Set near Jutland's west coast, the small village of Henne Kirkeby seemed an odd place for a Michelin-star restaurant. "What's it doing way out here?" I asked Peter. "The chef is something of a rock star," he replied with a grin.

Said star was Englishman Paul Cunningham, a man boasting some serious culinary credentials. As the former executive chef of the now closed Michelin-rated restaurant "The Paul" in Copenhagen's Tivoli Gardens, he has cooked regularly for the Danish Royal family.

Pulling up stakes to head to Jutland, the master chef now fronts Henne Kirkeby Kro, a 300-year-old thatched heritage inn renowned as one of Denmark's top dining venues. Serving up field-to-fork gourmet cuisine with vegetables from the restaurant garden, combined with artisanal local produce, the inn draws legions of loyal fans undeterred by the three-hour trip from Copenhagen.

Five-course affair

Behind the historic façade was an interior that was cool and contemporary, with crisp whites augmented with artistic flower arrangements and eclectic framed prints. Our waiter described the mélange of courses, with the menu reflecting what was in season. We all opted for the set lunch of five courses with corresponding glasses of wine. Although trying to watch my diet, especially regarding fried food, I figured if I was going to throw caution to the wind, this would be the place!

First up was an appetizer of a beef tartare topped with a quail's egg and tartlets (a favourite of the Danish royals) served alongside a salad topped with edible nasturtiums. A tomato salad featured five different types of tomato

including, green, cherry and heirloom, all harvested from the restaurant garden. The freshness was superb.

Next up, cod braised in rich stock was seasoned to perfection, served alongside garden-fresh green peas and Danish new potatoes. Chef Cunningham's fish and chips was a splendid take on the traditional British favourite. Flying gurnard coated with a feather-light batter paired with crisp chips further tantalized the taste buds. Dessert was a strawberry-rhubarb compote with mascarpone ice cream, a thoroughly decadent way to finish.

We were then treated by a visit with the man himself. Clad in striped apron and Danish slippers, Henne Kirkeby's guru cut an imposing figure. Tall, bald and bearded, his smile reminded me of the infectious charm of comedian/actor Ricky Gervais, along with a

PETER SYMES

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Chef Paul Cunningham (above) in his restaurant garden (left); Coffee and biscuits on the terrace (left); The inn (top right) and church (right) in Jelling

SCOTT BENNETT

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PETER SYMES

Danish floral design in the inn

very English sense of humour. "You've come a long way for fish and chips," he quipped.

Garden tour

After a cappuccino and biscuits on the terrace, the chef led us out back for a tour of the gardens. No mere plot, the operation was extensive, complete with a small greenhouse. Ruby-red strawberries, tomatoes, gooseberries and edible flowers jostled for space alongside a multitude of herbs. It doesn't get any fresher than that! Chef Cunningham's passion for food has not gone unnoticed. Since our visit, the restaurant has added another Michelin star.

Beachside

Bellies full, a short drive brought us to Henne Strand, a holiday town right on the coast. Stretching to the horizon in both directions, the powdery-white beach was imposing and thronged with holidaymakers unfazed by the unseasonable coolness. No diving here, however, as the North Sea remains shallow for quite a way out.

Jelling

A drive across the Jutland countryside brought us to Jelling, a small village with some big history. A 10th century Viking settlement, Jelling was a royal monument during the reigns of King Gorm the Old and his son Harald Bluetooth. (Yes, just like the wireless tech, which was indeed named after him). In fact, the roots of the present Danish kingdom can be traced back to Gorm the Old in a continuous line.

Dating from the transitional period between Norse paganism and Christianity, the site featured two massive royal grave mounds and the Jelling Church, a 12th century structure in the traditional chalkstone style. The adjacent churchyard is home to the Jelling stones, carved runestones bearing Denmark's best-known runic inscriptions. The older stone was erected by King Gorm in memory of his wife Thyra while the larger was raised by Harald Bluetooth in memory of his parents. Unfortunately, both are now encased in glass, courtesy of a drunken college student's late-night graffiti binge.

Jelling

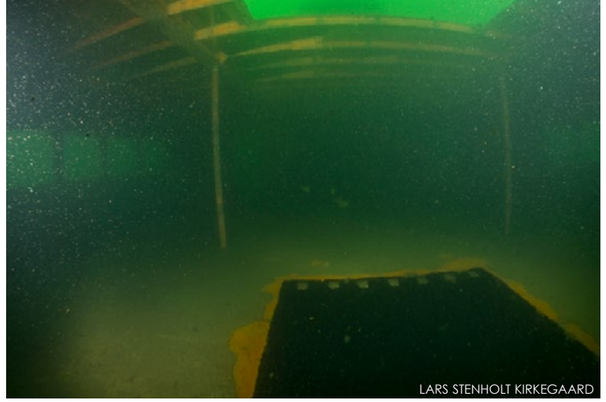
A hike up to the summit of the larger mound provided superb view over the entire area. With the glorious late afternoon light, it was a perfect photographic end to the day. A nearby supermarket was open, and we stocked up on pickled herring, blue cheese, smoked salmon and salads for dinner back at the house. Not that we needed much after our sumptuous lunch.

White Nights

Being the time of "White Nights," dinner was later than usual. As Denmark is positioned at a much higher latitude than Toronto, it did not get dark until well after 11:00 p.m. Even at midnight, a sliver of light illuminated the horizon. I suspected sleeping in would not be an issue.

Dawn came around 4:00 a.m., and outside my window, a cuckoo called, sounding like, well, a cuckoo clock. With car loaded and my trepidation mounting, we set out on the hour-long drive to Fyn's southern coast.


PETER SYMES


LARS STENHOLT KIRKEGAARD


LARS STENHOLT KIRKEGAARD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G. SYMES

Ringsgård Basin (above) near Ballen shown on locator map (below) where the *Ærøsund* ferry (center inset) was sunk; Views of the interior of the wreck after it was sunk in 2014 (right column); Peter Symes and author Scott Bennett prepare for a dive (left).


LARS STENHOLT KIRKEGAARD

Ærøsund wreck

Our destination was the M/F *Ærøsund*, Denmark's last train ferry and newest wreck. Here we would hook up with fellow diver Lars, who was bringing a group down from Odense. Most of the journey was by expressway and the Saturday morning traffic was light. Arriving at the park, we passed holiday caravans parked on the grass, the weekend campers unfazed by the cool weather. The Odense group had already arrived, and Jan was giving a briefing. The moment of truth had arrived!

Located in the Ringsgård Basin near the village of Ballen, the *Ærøsund* was sunk in a controlled scuttling in October 2014. Beforehand, the vessel had been decontaminated and made safe for diving and marine life. By June 2015, a steady growth of vegetation started to appear, and within a few months, the wreck had become heavily overgrown. Today, the *Ærøsund* is one of Denmark's most renowned artificial reefs. Positioned 550m from shore at a depth of 19m, the uppermost section (the funnel) is only 6m beneath the surface, making the wreck accessible for both freedivers and scuba divers.

With Peter's patient assistance, I managed to gear up with minimal difficulty. The weather was 16°C and overcast, not particularly summer-like. On the other hand, the coolness was a blessing; we would not broil in our layers and black drysuits while waiting to dive. The extra 45 pounds of combined weight belt plus steel tank ensured I did not move too quickly.

The divers had brought along two zodiacs, which would take both groups to the ferry. Nevertheless, after double and triple checks, the moment of truth had arrived. Waddling to the jetty, I wondered how I was going to lower myself down to the zodiac. The answer was cautiously and slowly. Climbing down from the much higher jetty was a challenge, but I made it.

Getting there required took only five minutes. We were in the second smaller group and waited for others to go in first. A backwards roll and I was in. The water was not as cold as expected—a balmy 16°C. Not bad for such a northern latitude. Right away, I noticed the water to be less buoyant than the ocean. Technically part of the Baltic Sea, the water was more on the brackish side and less salty.


Ærøsund wreck

Denmark


SCOTT BENNETT


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Small delicate anemone (above); Yellow sponges and small red anemones cover the walls along Lillebælt strait (left); Sugarkelp and seaweeds (right); Moon jellyfish are the most abundant species of jellyfish. They do sting but only so weakly that one cannot feel anything if touched; however, one's lips may feel a slight tingle, after coming into contact with the tentacles (bottom left).


SCOTT BENNETT

Diving the wreck

For the first dive, we concentrated on the main deck, so I could practice basic buoyancy skills. As it was my first time out, I opted to leave the camera behind. Due to recent rains, visibility was minimal, limited to only a few metres.

The vessel featured large openings for divers to swim through, with two yellow buoys anchored to iron chains to help divers locate them. The ballast remained in place, helping to stabilize the ship's upward position on the sandy bottom. The wreck's lowest portion was covered with mud and difficult to swim through without stirring up silt.

Finning around at a depth of five metres, marine growth was surprising, especially considering the wreck was just a few years old at the time we dived it. Clusters of yellow sponges were prevalent, adding a splash of colour. Some fish darted about, but moon jellyfish were especially numerous. Fortunately, they did not sting—a good thing, as a few brushed across my face. All in all, everything went rather well, and I looked forward to the next dive.

Unfortunately, it proved to be rather abbreviated. After my back-roll entry, I felt a surge of cold water rushing up my legs. Flood! As surface chop had intensified, getting back aboard the zodiac was a real struggle. Out of breath and feeling sheepish, I waited for the others to finish their dives. Peter soon resurfaced, and I explained what happened. "Don't worry, it happens to us all once!" he responded cheerfully. "All part of the learning process."

With diving finished for the day, we decided to take the scenic route back to do some photography. Pastoral vistas abounded; thatched roofs crowned traditional farmhouses, while orange poppies added vivid splashes to the surrounding fields. Fields of golden wheat rippled under a cobalt sky, the occasional tree interrupting the horizon. (Read more about diving the wreck in the following story on the sinking of *Ærøsund*).


Svendborg

Svendborg sojourn

Later in the afternoon, we stopped at Svendborg, a picturesque city nestled on Funen's southern coast. Established in the 12th century, the city is the gateway to Funen's southern archipelago. A shipbuilding hub for generations, the world's largest container ship company, A.P. Møller-Mærsk, had its origins in the city. Today it is a major sailing centre, with more Danish boats registered than anywhere else outside of Copenhagen. Each summer, the country's yachting elite inundate the cafe-dotted streets.


SCOTT BENNETT


PETER SYMES


PETER SYMES

Along the coastline of Thurø, just a few km from the town of Svendborg, Stone Age artefacts such as flint scrapers and bones can be found in shallow depths; Danish flower garden (left); Wild rosehip blooms (right)


PETER SYMES


Island of Thurø

Thurø

First, we made a detour over to nearby island of Thurø. Around Denmark's shallow bays, it is possible to find artefacts dating back to the Stone age and Peter wanted to show me such a location at Thurø Sund (Thurø Sound). The area was residential, with rambling old-style homes adorned with thatched roofs. Parking the car, we strolled down the lane towards the water, but it all appeared to be private land. A local homeowner asked what we were doing and then kindly invited us to walk through his property.

His home had been in the family for five generations, and they had been fisherman. One separate structure turned out to be the old smokehouse where fish were hung to dry. Although fishing had ceased years earlier, they now possessed some seriously expensive real estate! Although we did not find any arrowheads, the walk along the water was very picturesque. A dive-bombing seagull added some unexpected drama.

Thurø Sund is also unique biologically. Although meadows of carbon-storing seagrass are found in coastal areas worldwide, biologists have concluded those at Thurø Sund (sound) to be the most efficient found anywhere. This carbon-storing trait is garnering serious attention from scientists searching to reduce CO_2 emissions into the atmosphere.

Downtown Svendborg

Back in the city, we had a wander around the downtown center's pedestrian mall. Despite being Saturday, it was the pre-dinner lull, and the streets was largely deserted. Traditional architecture of wood and stucco flanked the cobbled streets while back courtyards revealed sequestered-away restaurants and shops. Some of the older buildings lacked right angles. Skewed and colourful, they proved especially photogenic.

DIY mentality

Arriving back at the resort, I faced something that was entirely new to me: We had to fill our own tanks. Although the resort did not have an actual dive shop, there were facilities onsite to fill the tanks. This trip was a true do-it-yourself endeavour and a rude awakening to those accustomed to extending a foot and having someone put a fin on it. (Like me!)

After a long day, we did not feel like cooking, so Peter's trusty iPad located us some pizza takeaway. Babylon Pizza proved a real cross-cultural establishment: a pizza joint, with a Middle Eastern name, run by Tamils. The enormous meat-lover's pizza was excellent! The next day was a literal washout, as it continuously poured with rain. It proved to be a good time to rest and do some photo editing.

Tides

With the Danish archipelago obstructing water passage from the Baltic to the Atlantic, channels between islands funnel tremendous amounts of water, and Little Belt was no exception. Currents at high tide can be especially fierce, surging up to three knots. Knowledge of incoming and outgoing tides is imperative, but a government website (https://ifm.fcoo.dk/select/index.html) produced by the Department of Defense's Centre for Operative Oceanography (Huh?) came to the rescue. Peter bookmarked it on his iPad, so our dive sites could be chosen accordingly.

In the Neolithic period, flint scrapers were often used to soften hides, or to clean meat off of hides, in addition to being used for wood work. Flint scrapers were essentially flakes from a globule of flint stone, say, the size of a football. Using another tool to apply pressure to one of the flat surfaces, it was possible to chip off these flakes, which were razor sharp along the edges—a technique that is often demonstrated in living museums today. The scrapers were thus relatively easy and fast to make, and once the edge got dull, they were resharpened by chipping away at the edge, until they were eventually discarded as new ones were made. As a result, over time, discarded scrapers and other refuse, such as animal bones and shells from clams and oysters, just piled up high at sites of Stone Age settlements. (See more info in next article).


PETER SYMES

Stone Age settlements were commonly placed along the coastline, preferably near creeks and estuaries. In the Stone Age, the sea level was lower, and contours of the coastline were quite different from today's. But in some places, such as Thurø Sound (shown in the image above, as viewed looking east, with the island of Langeland in the distance), it is possible to "guesstimate" where one might have been placed by studying bottom profiles on a sea chart. Thurø Sound forms a deep channel, so it must also have formed a coastline during the Stone Age. ■

PETER SYMES

Denmark

SCOTT BENNETT

View of the entry to Fænø Sund (top left); Delicate red anemones (top right); Crabs were numerous at Fænø Sund, and this one (left) was eating a freshly caught shrimp, its headless body firmly clasped in the crab's claw.

SCOTT BENNETT

Fænø Sund

The next day we headed back to Fænø Sund, only a few minutes drive from our cottage. This time, we could park adjacent to the site, so getting gear to the water's edge was far more expedient. Hovering around 19°C, temperatures were cool for June, but most comfortable when sitting in a drysuit during our surface intervals. Conditions were calmer too, so the dive would be a lot easier with a simple shore entry. I opted to go without the camera to concentrate on improving my drysuit skills.

Visibility was a bit murky on the surface but cleared as we went deeper. The sandy bottom was punctuated with weeds and more crabs than I have ever seen in one place. Along with a multitude of mussels, the sand was buzzing with tiny gobies. We even startled a small flounder, which promptly vanished in a flurry of sand.

Feeling confident, I took the camera for the second dive. Although less flexible than a wetsuit, the drysuit did not hinder my photography. The crabs were tolerant, so I could get close to shoot some portraits. One was eating a freshly caught shrimp, its headless body firmly clasped in one pincher. The gobies were more skittish, but I still got some images. Peter pointed out some anemones, which were the smallest I have ever seen. Like tiny red jewels, they were a stark contrast to the muted tones of the sand.

New Little Belt Bridge

Checking the tides for the next day, we decided on a site on the Jutland side, close to the New Little Belt Bridge. Conditions were perfect, with almost no current and a glassy surface. With gearing-up time quickening, I felt confident as I entered the water. However, the dive gods had other plans. My release valve was jammed, and I could not deflate the suit. Bobbing helplessly on the surface, I felt like the Michelin Man. So much for the dive…

Fænø Sund

A quick trip to Dive 2000 was required to remedy the problem, and Jan took care of it pronto. It turns out that late the next afternoon, he was taking a student out for an open water dive at Søbadet, a site near our resort. We agreed to meet up. It was a plan. Heading back, we decided on another dive at Fænø Sund as it was close to home. I especially enjoyed photographing the anemones along with some appealing white starfish tinted with hues of yellow and red. We later headed back to photograph the sunset. Crimson and orange tones set water and sky aglow, while in the opposite direction, a huge full moon ascended. The time? Eleven o'clock, and we still had not eaten dinner yet.

Søbadet

After a leisurely start the next morning, we headed to Søbadet (The Sea Bath), situated near the Old Little Belt Bridge. Renowned as one of the area's premier dive sites, it is not only popular with Danish divers, but with visiting Dutch and Germans. We parked in front the old sea bath house, a distinctive yellow building about 30m from shore. Carrying all our gear to the water took some serious effort!

A small jetty made a great spot to gear up, with only a short swim to the deeper water. Søbadet is one of Denmark's sole "multiple-level wall dive" sites, and just offshore, the dive area is indicated by large yellow buoys.


PETER SYMES

A brilliant sunset over Fænø Sund in the region of Funen, or "Fyn," as the Danes call it

Large numbers of moon jellyfish pulsed off the jetty. As the tide slackened, many became stranded in the shallows to ultimately wash up on shore.

A chain anchored to the bottom made an easy trail to follow out to the wall. Expanses of eelgrass quickly changed to sugarkelp, a brown algae resembling large lasagna noodles. Goldsinny wrasse darted amongst the fronds along with the omnipresent moon jellies. Frequently brushing my face, I was grateful they did not sting! It was an environment unlike anything I had seen before, but huge quantities of sediment made photography an impossibility.

Following the chain to a depth of seven metres, we reached the first level of the wall. Along the top, sugarkelp and *Laminaria hyperborea*, a leathery seaweed, undulated gently—an indication the current was still slack. Following the chain, we descended to a plateau with a width of two to three metres. Farther down was another wall and another step before it sloped down to 25 to 30m.

As Peter said, the seabed was flat and lifeless at that depth, so we opted to stick with the wall. Descending farther, the environment changed yet again. Sea squirt colonies abounded along with pink oaten pipe hydroid and plumose anemones. The wall itself was not actually rock, but clay. Nevertheless, it was riddled with nooks and crannies, providing hiding places for fish and molluscs. A viviparous eelpout (one of the most unlikely fish names I ever heard) added a splash of red to the yellow of the sponges. Shooting close to the wall with twin strobes really helped minimize backscatter.

Heading back, the current picked up considerably. Struggling with my release valve, I turned it the wrong way, filling my suit with air. Holding the chain at the safety stop, my feet went upwards and the rest of me promptly followed. Fortunately, we were not deep, but I surfaced right into a current, which started whisking me away from the jetty. After a brief bit of panic, I managed to get ashore. Peter volunteered to return to the house to make us some lunch. Reluctant to shed the drysuit, I remained to snooze on the jetty.

Final dive

Weary, yet undeterred, I was eager for another dive. Heading back down, we followed the chain to the wall. The rocks at the base proved to be my favourite part of the dive. Upon closer scrutiny, a myriad of creatures was revealed. Clusters of

Drysuit Newbie: Taking the Cold-Water Plunge

I will be honest; when it comes to cold water, I am something of a wuss. With most my 900+ dives regulated to the tropics, cold water diving is a concept that usually fills me with trepidation. I have managed some dives in the Great Lakes in Canada as well as South Africa. On the cool side to be sure, I managed just fine with a 7mm wetsuit.

However, diving in Denmark often calls for a drysuit. With such experience nil (an unsuccessful attempt one January in Copenhagen, notwithstanding), this would prove to be something entirely different. However, new experiences are a good thing, and pre-conceived notions are not. Besides, I had the perfect dive buddy to help me along. It was time to take the plunge.

Donning in the field

Trying on gear in the store was one thing but getting ready on location was an entirely different animal. It was strange to consider I was wearing track pants and t-shirt that would not be getting wet inside the suit (in theory, anyways, but more on that later). After putting on the shell, Peter showed me how to apply baby powder over the rubber seals at the neck and wrists to make them easier to get into. Boots were attached to the suit in one piece, but the gloves were separate wet gloves.


PETER SYMES

Weight

My weight belt was in the form of a shoulder harness that effectively balanced the 30 pounds required. Factor in the 15-pound steel tank and it made for some serious heft. The 45 pounds of combined weight belt, plus one tank, ensured I did not move too quickly. My tank was attached to a BCD, but I would not be using the latter for buoyancy. I could not help but think that if I was wearing a 3mm wetsuit in the tropics, I would be already in the water photographing stuff.

Underwater, but dry inside

When one is not used to it, the feeling of being underwater, yet dry inside, was decidedly odd. Once in the water, overall flexibility was noticeably reduced compared to a wetsuit but not uncomfortably so. The biggest difference was the lack of a BCD. The inflator on the suit itself was easy enough, but the control valve just behind my left shoulder took some getting used to. Not particularly difficult, mind you—just different.

Bouyancy challenges

I found the hardest part was maintaining buoyancy with the control valve. Just turning one's shoulder a certain way was enough to release air from the suit. That is, if you open it properly before going underwater. On a few occasions, I mistakenly had it closed instead of open. I had been warned that too much air in the suit can result in floating upwards feet-first. And yes, it happened. Several times.

Flooding the suit

In the end, everything that could go wrong, did. Flooding the suit due to an improperly closed zipper was probably the absolute low point for embarrassment, but I was assured that it happens to everyone. Another very minor flood occurred due to an improper seal on either a wrist or the neck.

In retrospect, these mishaps proved to be a good thing. These were all situations I needed to know how to deal with. Gearing up was cumbersome at first but got progressively easier. By the final dive, the stars aligned, and everything went perfectly. Goodbye trepidation, hello cold water. I'm hooked! ■


SCOTT BENNETT


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Red whelk were numerous at Søbadet (above)


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Common goby (above); A view of the Old Little Belt Bridge over the New Little Belt Bridge in the distance (right)

Viviparous eelpout next to a red whelk with a tiny nudibranch hitching a ride (above)

blue mussels abounded, as a myriad of crabs scuttled. Red whelks were everywhere; many were encrusted with tiny strawberry anemones. One whelk yielded a real surprise. Hitching a ride was a nudibranch so small, I failed to see it until examining the photo on my laptop. I spotted another eelpout and this one sat still long enough for me to photograph it. Illuminated by my torch, the colours were quite striking, especially in contrast to the wall's grey tones.

Perched vicariously atop one kelp frond, a tiny spider crab brazenly raised its pinchers in defiance of my close approach. I could just make out a Yarrell's blenny peering out from a crevice but could not get a photo. Tadpole fish could also be observed along with the occasional lobster.

Then, it got cold. REALLY cold. Turns out we blundered into a serious thermocline. I was so engrossed with my photography that I scarcely paid much attention. Some 15 minutes later, it was a different story. Warmer water beckoned, and we made our way back to the shallows. This time, I was grateful my safety stop did not involve shooting to the surface feet-first. Back on shore, I was elated that everything went perfectly for our final dive. It turned out the water was a brisk 6°C. "If you can handle that, you can dive pretty much anywhere," said Peter with a grin.

Diverse diving

The entire Little Belt area offers a variety of dive sites. Just before the old bridge on the way to Jutland, a turnoff leads to Kongebrogaarden Marina. Adjacent to the Marsvinet Dykkerklubben (dive club), an underwater trail follows the stone reef into the Little Belt. Ideal for novice divers, the trail extends for 50m, with a maximum depth of 12mm.

Along its length, nine markers provide information about the diversity of life to be observed around the reef. Signs are numbered one through nine, with an arrow pointing to the subsequent marker. Fish species vary depending

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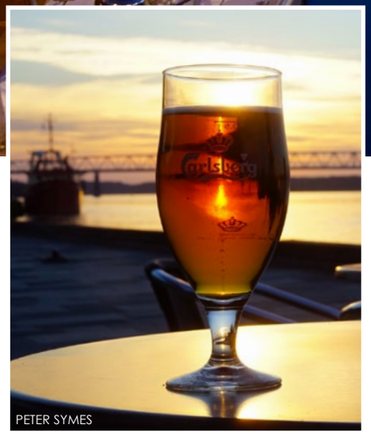
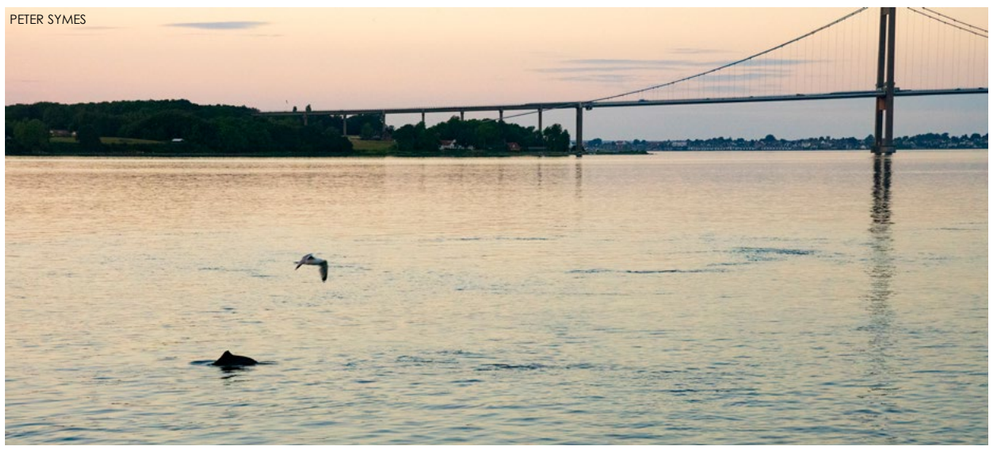


PETER SYMES



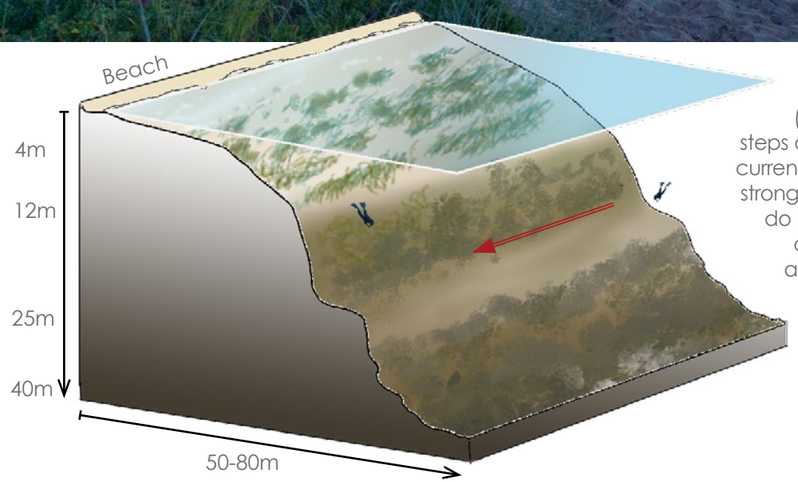
PETER SYMES

Fishing boats in Middlefart's harbour, with the Old Little Belt Bridge in silhouette (top); Danish Carlsberg beer at Café Jazz, where a porpoise was spotted in the bay, with the New Little Belt Bridge (right).

on the season, with viviparous blenny, topknot, goby, lumpfish and goldsinny wrasse frequently observed. Nudibranchs are especially common during the winter months. Another trail starts near the Café Jazz in Middelfart, continuing along the coast right to the dive club.

For our last night, we headed back into town for another meal at the Café Jazz. Securing a table on the patio, we enjoyed pre-dinner drinks as the setting sun silhouetted the Old Little Belt Bridge and painted the horizon with crimson tones. A harbour porpoise appeared to complete the postcard setting. Heading back to the resort, we made a stop at Middelfart Harbour. Despite the midnight hour, the last vestiges of sunlight peered above the horizon as fishing boats sat motionless on the still water—another postcard view. That's Denmark for you. ■

The Bottom Contour of Lillebælt (Little Belt)



Generalised bottom contour along Little Belt (left). It drops off in distinct steps and ledges. At depth, the current can sometimes be quite strong. If caught by the current, do not fight it. Instead, simply ascend in a calm manner and swim perpendicular to the coast. If you end up a bit farther down the beach, you just have to trot back to your starting point... with all your gear.

Free Little Belt Guide: Did you know that Little Belt has one of the densest populations in the world of the smallest whale on earth—the porpoise? Learn more about Little Belt's nature, dive sites, beaches, tours, activities, food, restaurants, lodging, arts and attractions in the free 112-page e-book (in English/German/Danish) at: **e-pages.dk/jfmadhoc/912/**

A hermit crab takes the shell off a red whelk (left). Hermit crabs will indeed fight over good shells, and a strong crab can wrestle a weaker occupant out its shell, if it fancies the shell. The evicted individual then has to scurry about to find a new shell to protect its vunerable rear parts.

It is a late mid-summer evening at Søbadet by Little Belt when Scott Bennett (left) takes in the ambience, shooting photos for his article in this issue. The opposite coast shown in the photo is Jutland, the peninsular part of Denmark. At this point, the strait is about 800m wide.

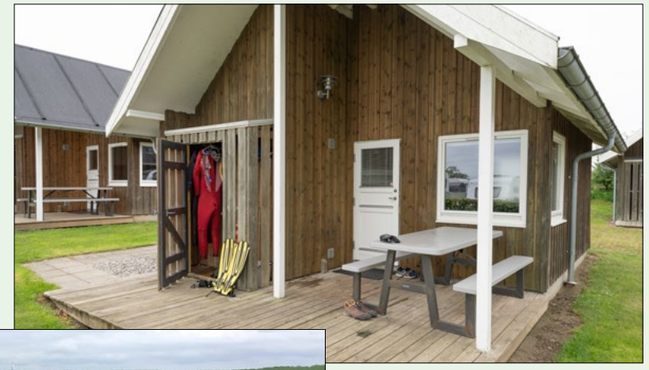
Dead man's fingers, *Alcyonium digitatum* (above), is a ubiquitous species of soft coral that colonises parts of the walls in Little Belt, as well as other areas where there is a solid substate. The polyps feed at various times of the day, with their tentacles extended. They are suspension feeders gathering plankton from the water with the help of cilia and absorbing oxygen at the same time.

Long-legged spider crab, *Macropodia rostrata,* has a hairy, or fuzzy, appearance due to algae that it applies to itself for camouflage (above).

Gl. Ålbo

Photos by Lars Stenholt Kirkegaard

On the Jutland side, or the western coast, of the Little Belt, Gl. Ålbo Camping is equipped to cater for divers.



Cabins with lockers for dive equipment, a diver-friendly jetty and a filling station has made Gl. Ålbo a popular resort—especially among divers from Germany, which is just a couple of hours' drive away.

Luxury huts & fine dining nearby

Denmark currently does not host dive operations in which diving and accommodation is offered in one package, as is popular in many other countries, which may be the biggest obstacle holding back dive tourism in Denmark from becoming properly established. However, Gl. Ålbo is one exception, where everything is provided in just one spot in front of an excellent house reef and fine dining is not far away.

While not a five-star resort, Gl. Ålbo does have modern luxury huts (with up to six beds, loft, kitchenette, bathroom, heated floors and a deck) and an 8-bed/2-bath holiday cottage, which are comfortable and clean, with opportunities to mix with other divers. See: **Gl-aalbo.dk**

Drive to fine dining restaurants in nearby Bjert (11 minutes), Kolding (25 minutes) and Fredericia (45 minutes), including the Micheline-star New Nordic Cuisine restaurant Ti Trin Ned. See: **titrinned.dk**

Between dives, why not try a culinary adventure with New Nordic Cuisine in Denmark?

The New Nordic Cuisine

Text edited by G. Symes

The New Nordic Cuisine is a culinary movement that burst onto the global gastronomic scene in the early 2000s. Developed by chefs in Scandinavia, of which Claus Meyer and René Redzepi were the pioneering innovators and founders of the world-renown Noma restaurant in Copenhagen (four-time winner of the "World's Best Restaurant" title in *Restaurant* magazine), the idea was to revamp traditional local cuisine by using principles of "purity, simplicity and freshness" as well as emphasise seasonal produce grown or foraged locally, benefitting from the region's unique climate, water and soil, including traditional local favourites such as Danish new potatoes, strawberries and asparagus.

In addition, the chefs revived and adapted older Scandinavian techniques, such as marinating, smoking and salting, as well as prepared local organic foods such as oats, rapeseed, cheeses and heirloom varieties of apples and pears, using methods that maintained their natural flavours.

Since its inception, the trend has spread and evolved. In 2004, the Nordic Kitchen Manifesto established ten principles based on "purity, season, ethics, health, sustainability and quality," written by chefs from the Nordic lands of Denmark, Sweden, Norway, Finland, Iceland, Greenland, Åland and the Faroe Islands.

Today, the aims of the New Nordic movement have been taken up by many chefs and local kitchens around the world—revamping traditional dishes and creating new ones with fresh local, sustainable and traceable ingredients—as well as governments, institutions, agencies, schools, universities, food production and supply chains, guided by the principles of the Manifesto. ■ SOURCES: THE GUARDIAN, NORDIC CO-OPERATION, VISIT COPENHAGEN, WIKIPEDIA

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TOMISLAV MEDAK / FLICKR COMMONS / CC BY 2.0

Denmark

Toast with turbot, herbs and vinegar dust (far left) and raw shrimp with seaweed, rhubarb and herbs (below) at Noma (left), the flagship Micheline-star restaurant in Copenhagen, Denmark, founded by chefs Claus Meyer and René Redzepi, who pioneered the New Nordic Cuisine

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New Nordic Cuisine at Geranium (above and center); Heart salad with fresh hazelnuts, apple, hazelnut oil, cucumber flowers and white currants (center left) and white asparagus with poached egg yolk and woodland sauce (right) at Noma

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Several restaurants serve New Nordic Cuisine in Denmark, including Ti Trin Ned in Fredericia (above), Hærværk in Aarhus and Geranium in Copenhagen.

WILLIAM LIONEL WYLLIE / PUBLIC DOMAIN

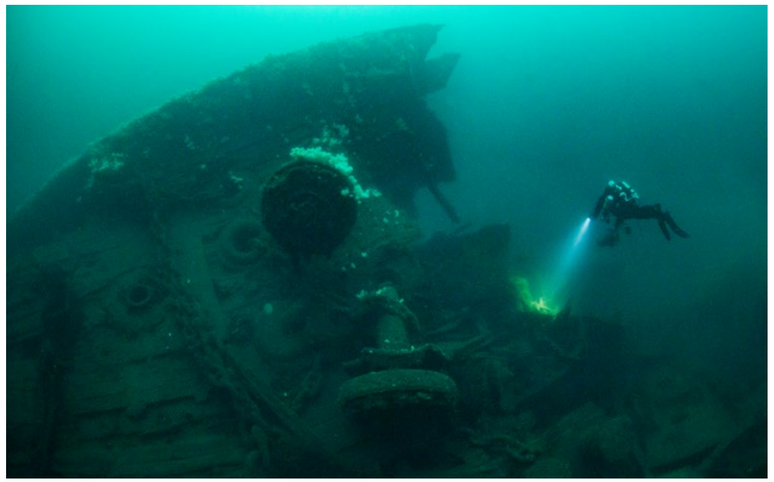
Denmark's Wrecks

— A Selection from WWII back to the Age of Sail

Text by Peter Symes. Underwater photos by René B. Andersen

HMS Defence

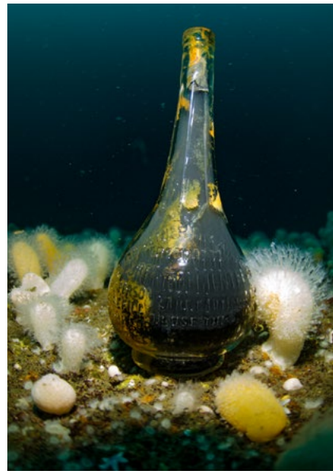
On 31 May 1916, the armoured cruiser HMS *Defence*, depicted on the painting above, was sunk after being fired upon by a German battlecruiser and four dreadnoughts. Two salvoes from the German ships detonated her rear magazine, and in turn, her secondary magazines. The ship exploded, with the loss of all men onboard but one. Between 893 and 903 men were killed and went down with the ship. The wreck is now a designated and protected resting place. Despite its violent demise, it has been found to be largely intact.



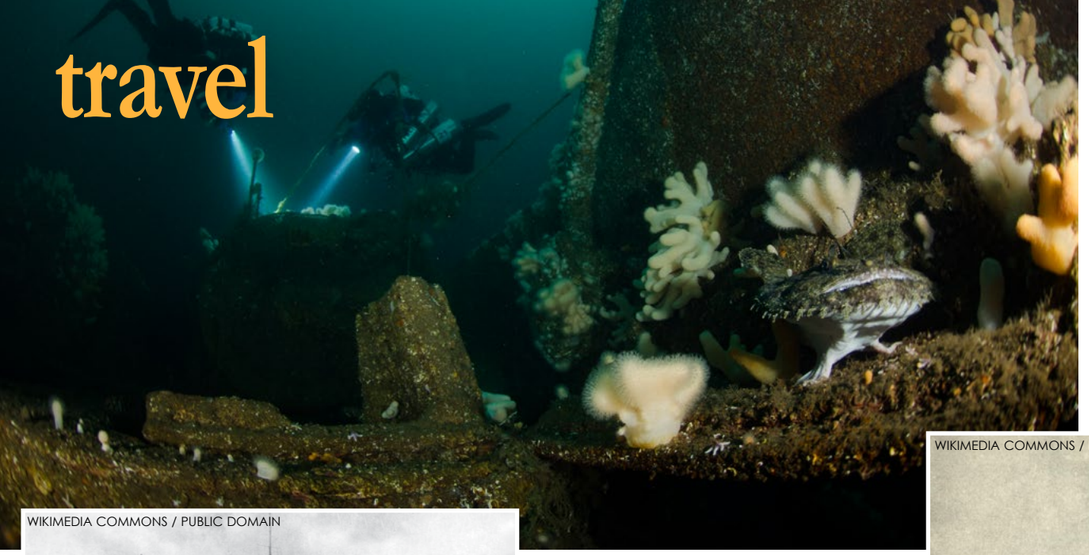
WWI Battle of Jutland Wrecks

The Battle of Jutland was the largest surface naval battle ever, in terms of displacement, and the only full-scale clash of battleships during the First World War. Britain suffered more casualties and lost more ships than Germany, but the outcome was a strategic success for the British, since it resulted in the successful containment of the German Imperial Navy's High Seas Fleet. Of the 249 ships that fought in the Battle of Jutland, 25 were sunk.

Battle of Jutland



Flask on HMS *Defence*



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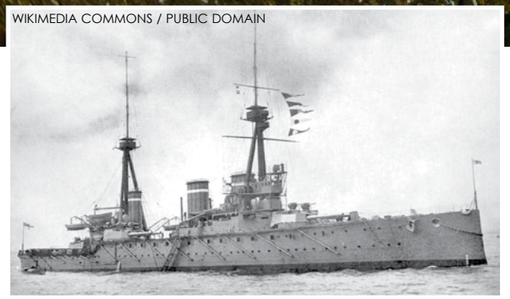

HMS Invincible

With an overall length of 567ft (173m) *Invincible* was significantly larger than her armoured cruiser predecessors of the *Minotaur* class, the lead ship of her class of three battlecruisers. During the Battle of Jutland, *Invincible* suddenly appeared as a clear target before German battlecruisers *Lützow* and *Derfflinger,* which fired three salvoes each at *Invincible* and sank her in 90 seconds. The midships magazine exploded, which blew the ship in half—1,026 sailors were killed. The wreck rests on a sandy bottom at a depth of 180ft (55m).

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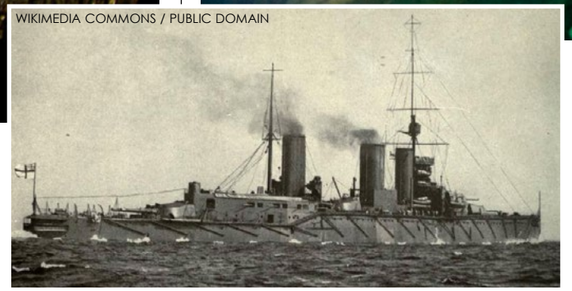
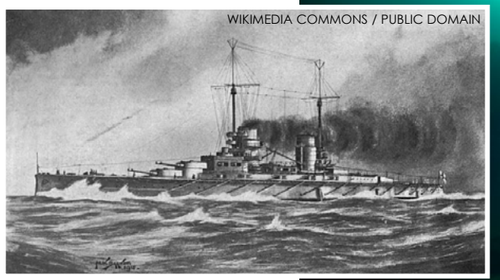


HMS Queen Mary

HMS *Queen Mary* was the last battlecruiser built by the Royal Navy before the First World War. The ship never left the North Sea during the war. During the Battle of Jutland, she engaged the German battlecruisers SMS *Seydlitz* and SMS *Derfflinger*. A shell from *Derfflinger* ultimately hit forward and detonated one or both of the forward magazines, which broke the ship in two near the foremast. A further explosion, possibly from shells breaking loose, shook the aft end of the ship as it began to roll over and sink—1,266 crewmen were lost and only 18 survived. Maximum depth is 57m.



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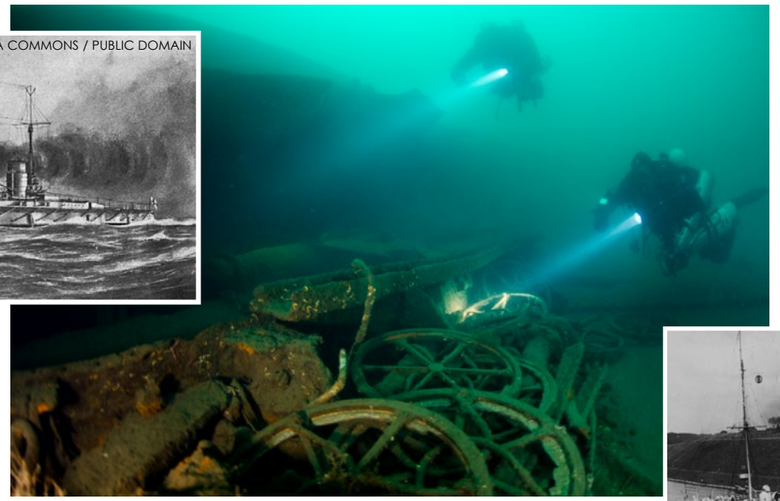


WIKIMEDIA COMMONS / PUBLIC DOMAIN

SMS Lützow

Lützow was a German battlecruiser, which was heavily engaged during the Battle of Jutland. It was involved with the sinking of the British battlecruiser HMS *Invincible* (see above) and is sometimes given credit for sinking the armoured cruiser HMS *Defence* (previous page). During the battle, she was heavily damaged by heavy-calibre shell hits, which led to the flooding of her bow, and she was in serious danger of capsizing. As a result, the ship was unable to make the return voyage to Germany. Her crew was evacuated, and she was sunk by torpedoes fired by one of her escorts. Depth at her resting place is 43m.

SMS Frauenlob

Frauenlob saw little action during the Battle of Jutland, but in one of the chaotic night engagements as German forces tried to disengage and return home, *Frauenlob* was hit by a torpedo launched by the cruiser HMS *Southampton*, which caused the ship to capsize and sink with the vast majority of her crew. The wreck sits upright on the seafloor and is largely intact. Maximum depth is 55m.

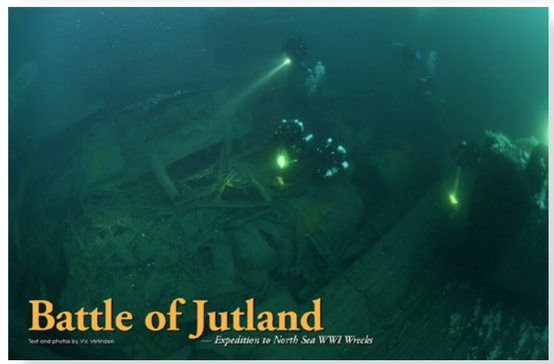
SEA WAR MUSEUM JUTLAND

Sea War Museum Jutland

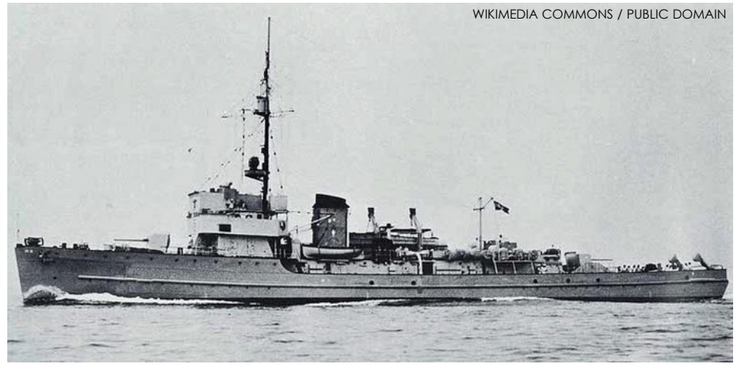
Thyborøn is a fishing village on Jutland's North Sea coast as well as the location of the Sea War Museum Jutland. The museum is one of a kind. The main focus of the museum is the maritime warfare in the North Sea during the First World War, in particular, the "Battle of Jutland." Visit: **Seawarmuseum.dk**

In connection to the museum, a memorial park for the Battle of Jutland has been erected in the dunes next to the sea. Visit: **Jutlandbattlememorial.com**

Click below to see articles about the Battle of Jutland in *X-Ray Mag*



M36 is located in Langeland Strait, which is the southern part of The Great Belt



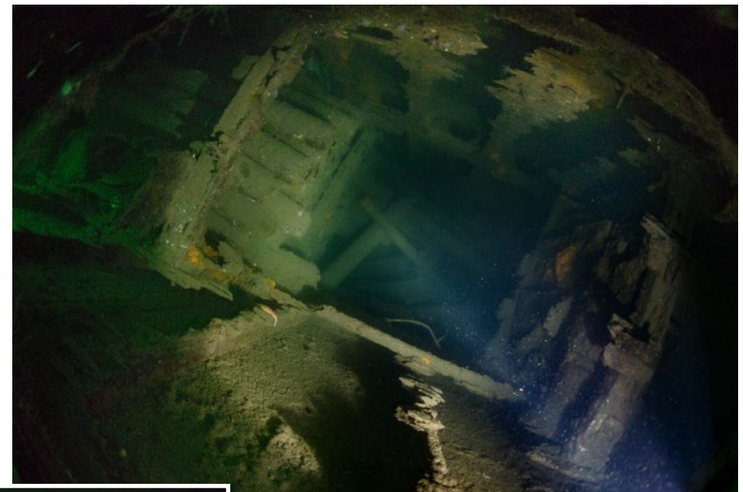
WIKIMEDIA COMMONS / PUBLIC DOMAIN

M36 "The Inverted"

The WWII German minesweeper was sunk by British Beaufighter bombers in 1945 and now rests at around 30m at the edge of the deep-water shipping channel. The often strong currents and the intense shipping traffic passing nearby makes this one of the most challenging dives. On a good day, it is one of the most impressive wrecks. It is nearly 100m long, and still has its gun turrets, torpedo tubes and machine cannon. The propellers and rudder are also impressive. It lies on its side, hence it is known as "Den Omvendte" ("The Inverted").

M575

M575



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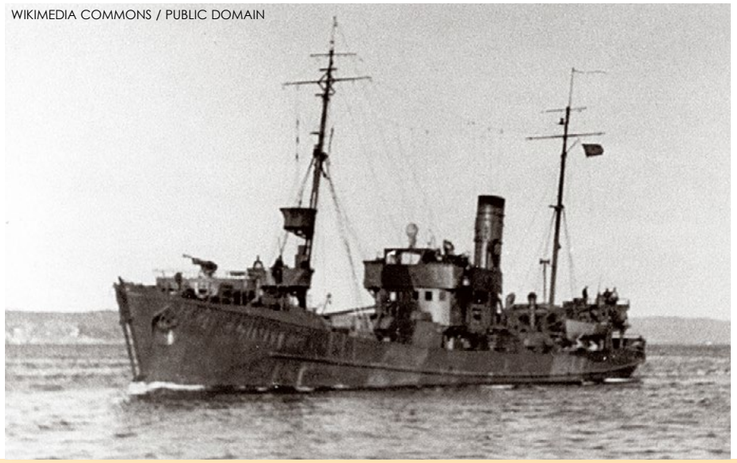
M575 is another WWII German minesweeper but not a casualty of war, as such. She foundered in bad weather on 2 March 1945 after taking on water and before she could make it back to Helsingør, a port at the narrowest point of Øresund. The wreck rests on its port side at a depth of 26m, just north of Helsingborg. Visibility on the wreck varies, and currents can be strong, as it is located in the strait.

M1108 "Dr Eichelbaum"

M1108 "Dr Eichelbaum"

M1108 "*Dr Eichelbaum*" was an armed trawler—a fishing vessel converted for naval service. Around the onset of WWII, the ship began service in the German Kriegsmarine's 11th minesweeping squadron. On 13 April 1940, when it was rammed by the steamer S/S *Scandia* in Storebælt (Great Belt) and quickly sank with the loss of one sailor. While the wooden wheelhouse seen in the below photo is no longer there, the rest of the wreck is quite intact and sits upright on the bottom. In front of the bow, a long boom, which was part of the mine-sweeping equipment, now lies stretched out across the seabed. The hold can be penetrated, but be careful because of the accumulated silt. There is a plaque on the deck, in front of the bridge, dedicated to a diver who perished inside. The parts behind the bridge have lots of details, including the now empty davits, which are still in place but missing their lifeboats. Depth is 27m. Currents are usually not strong in this part of the strait.



WIKIMEDIA COMMONS / PUBLIC DOMAIN

PETER SYMES

ABOVE: Artefacts found on *Dr Eichelbaum*. In the upper right corner, there is a crate with code wheels for an **Enigma**-coding machine. The Enigma was a top-secret cypher device used by all branches of the German military during WWII. The Germans believed, erroneously, that the Enigma machine was so secure that even the most top-secret messages were enciphered on this device. During the war, British cryptologists, led by Alan Turing, decrypted a vast number of messages enciphered on Enigma. The intelligence gleaned from this source, codenamed "Ultra" by the British, was a substantial aid to the Allied war effort. Several movies, docudramas and documentaries have been produced about these events.

The Law Regarding Finds & Artefacts

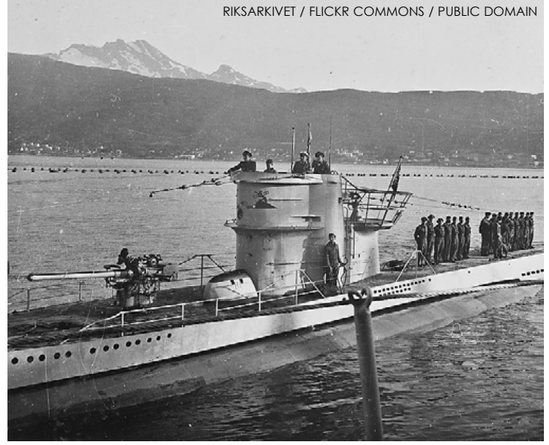
PETER SYMES

Contrary to widespread belief, a wreck, its cargo and any artefacts that may be found on or around wrecks, *always* have an owner. There is no such thing as an ownerless or "abandoned" wreck. There are only wrecks for which the owner may not be known, or cannot be immediately identified, but in principle, somebody owns them. In some cases, it is an insurer.

Get permission: If a wreck is younger than 100 years, permission to retrieve "souvenirs" can be applied for on the Danish Maritime Authority's **website.** (The form is in Danish, sorry). Retrieved artefacts may not be sold. Wrecks and sites that are over 100 years old are protected under the "Museum Law," and artefacts may not be retrieved. This includes loose or detached objects laying on the seabed. ■

U-251

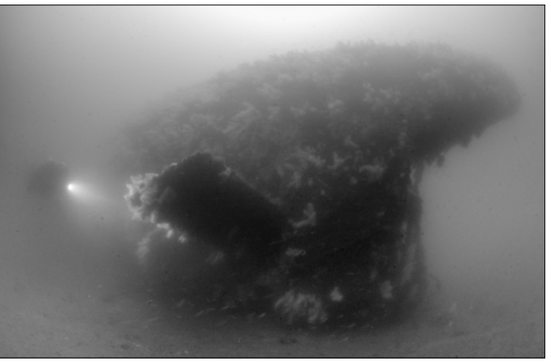
RIKSARKIVET / FLICKR COMMONS / PUBLIC DOMAIN



U-251

Type VII U-boats were the most common type of German World War II U-boat. The Type VIIC was the workhorse of the German U-boat force, with 568 commissioned from 1940 to 1945. U-*251* was sunk on 19 April 1945 in the Kattegat by rockets and strafing from eight British and Norwegian Mosquito aircraft, with the loss of 39 sailors. Four survived. The location is just southeast of the Danish island of Anholt. The submarine rests upright on the seabed at a depth of 35m.

The conning tower has quite visible battle damage, as does the foredeck. A hatch is open and so is a torpedo tube, but penetration is not recommended due to silt inside the submarine. The propellers are still there. Many fish, such as cod, usually congregate around the wreck.



SS Ostmark

SS *Ostmark*

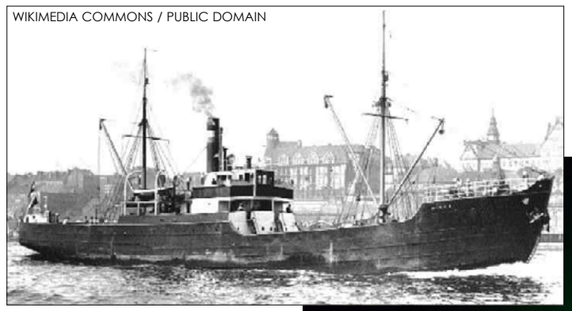
A steamer built in France in 1935 and originally named *Côte d'Argent,* it was commandeered into German service during WWII, equipped with cannons, and renamed SS *Ostmark*. By 1943, it served as a minelayer. In early 1945, she took part in the evacuation of refugees from the Eastern Front. Sunk by British Halifax bombers on 21 April 1945—109 of the ship's complement of 240, perished. Caution: The wreck apparently still holds a significant amount of ammunition. Depth is 32 to 45m.

WIKIMEDIA COMMONS / PUBLIC DOMAIN

Minos (SS Hellfrid Bissmark)

Minos is one of the more popular and most visited shipwrecks. It was a German steamer, which struck a mine in 1939 en route from the German port of Kiel to Malmø, Sweden, with a cargo of nitrate. The shipwreck remains relatively intact, but parts of the superstructure have begun to deteriorate and collapse. It is possible to enter the cargo hold and boiler room. The depth at the location is 27m and is usually not subject to strong currents.

WIKIMEDIA COMMONS / PUBLIC DOMAIN



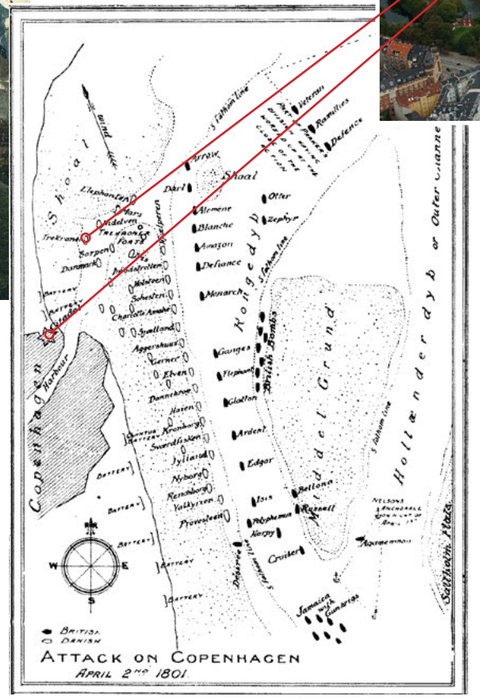
SS *Hellfrid Bissmark*

WIKIMEDIA COMMONS / PUBLIC DOMAIN

The First Battle of Copenhagen, 2 April 1801. Painting by John Thomas Serres. The city's towers can just be made out behind the gunsmoke.

PETER SYMES

The entry to Copenhagen's harbour today (right), just outside of which the battles took place. On the left is the citadel and, guarding the entry, is Trekroner fort. The fort was an important part of the Danish line of defense during the Battle of Copenhagen in 1801. The fort also was engaged during the British attack on Copenhagen in 1807. The area between the windmills and the moored warship are now landfill, as are the parts in the upper left.



WIKIMEDIA COMMONS / PUBLIC DOMAIN

Backgrounder: Battles & Bombardment of Copenhagen

During the French Revolutionary and Napoleonic Wars in the early 19th century, two major battles took place off Copenhagen, which left several shipwrecks—some with cannons still onboard—just outside the city and in fairly shallow waters.

At the beginning of 1801, during the French Revolutionary Wars that pitted France against Great Britain, Britain's principal advantage over France was its naval superiority. The Russian Tsar Paul, having been a British ally, arranged a League of Armed Neutrality, comprising Denmark, Sweden, Prussia and Russia, to enforce free trade with France. The British viewed the League to be very much in the French interest and a serious threat.

1801

The first battle fought on 2 April 1801, came about over British fears that the powerful Danish fleet would ally with France. As the British ships closed in on Copenhagen, in whose harbour the Danish fleet was anchored, several Danish ships stationed in the city's inlet formed a blockade. Most of the Danish ships were not fitted for sea but were moored along the shore with old ships (hulks), no longer fit for service at sea, but still powerfully armed, as a line of floating batteries off the eastern coast of the island of Amager, in front of the city in the King's Channel (a shipping lane leading to the port).

The Danish fleet defended the capital with these ships and bastions on both sides of the harbour inlet. Eventually, the battle swung decisively to the British, as their superior gunnery took effect. The Danish agreed to the British terms upon hearing news of the death of the Russian tsar, as it meant they could cut their ties with the French without fear of retaliation by Russia.

Of the Danish ships engaged in the battle, two had sunk, one had exploded, and twelve had been captured. As the British could not spare men for manning prizes, as they suspected that further battles were to come, eleven of the captured ships were burned.

This was not to be the end of the Danish-Norwegian conflict with the British. In 1807, similar circumstances led to another British attack, in the Second Battle of Copenhagen.

1807

Despite the defeat and loss of many ships in the First Battle of Copenhagen in 1801, Denmark-Norway (possessing Jutland, Norway, Greenland, Schleswig-Holstein, Iceland and several smaller territories) still maintained a considerable navy.

Faced with the prospect of Napoleon defeating Russia and Prussia, which would lead to French control of Baltic fleets, the British felt compelled to take action and pre-empt the substantial Danish navy from siding with the French. Although ostensibly neutral, Denmark was under heavy French pressure to pledge its fleet to Napoleon. Britain also had valuable trading interests in the Baltic, which was a vital source of naval supplies.

In early August 1807, a British expeditionary force, comprising more than 400 warships and transports carrying more than 29,000 troops, reached Danish waters and demanded that the Danes allow their fleet to be taken into British control. The Danes refused, and hostilities began.

The British landed an army in Zealand, which invaded Copenhagen, and on 2 September, began a fierce bombardment of the city after the Danish king refused to surrender his fleet. The bombardment included 300 Congreve Rockets, which caused fires. Due to the civilian evacuation, the normal fire fighting arrangements were ineffective; over a thousand buildings were burned. Soon, much of the city was in flames, and the Danes, suffering heavy civilian casualties, were forced to surrender on 7 September.

Denmark agreed to surrender its navy and its naval stores. In return, the British undertook their departure of Copenhagen within six weeks. On 21 October, the British fleet left Copenhagen for the United Kingdom. ■

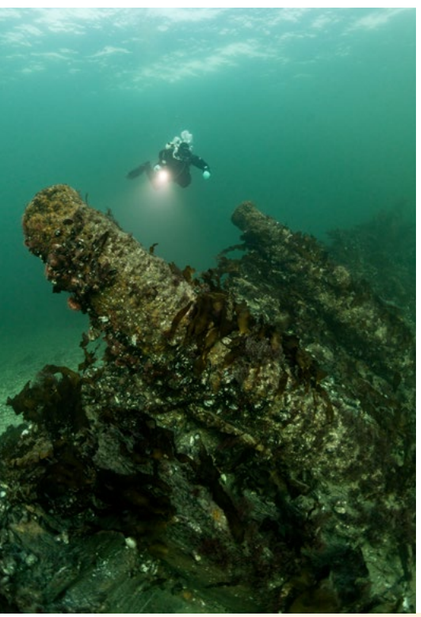
Kanonvraget (Cannon Wreck)

NORDNORDWEST / GFDL

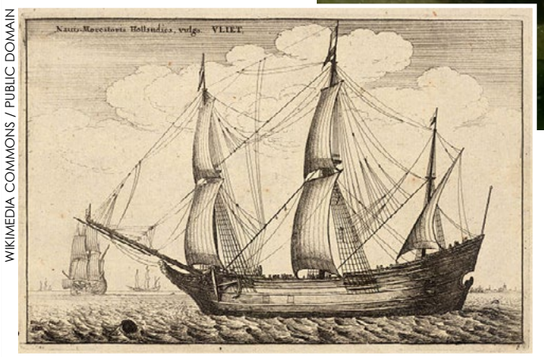
Kanonvraget

This wreck lies at a depth of only nine to 12m of water, which is often above the thermocline. Thus, it is often in winter, when there is little planktonic algae, that one gets the best visibility. Despite its position in a busy strait, the wreck was not located until 2002. The identity of the wreck has not yet been established. The ship is estimated to have been approximately 48m long, and due to the 16 large 12 to 14-pounder iron cannons that now lie scattered about on the wreck, the Swedish archaeologists who found the wreck assumed it was from the First Battle of Copenhagen in 1801.

However, according to Danish marine archaeologists, there are no vessels from this battle known to have wrecked in the middle of the Sound. Another theory has it that it is the frigate *Charlotte*, which foundered in 1737, in about this location, but her length is believed to have been 36 to 40m, and armed with six-pounder cannons, so it is probably not her either.



Fløyte Træ Vrag



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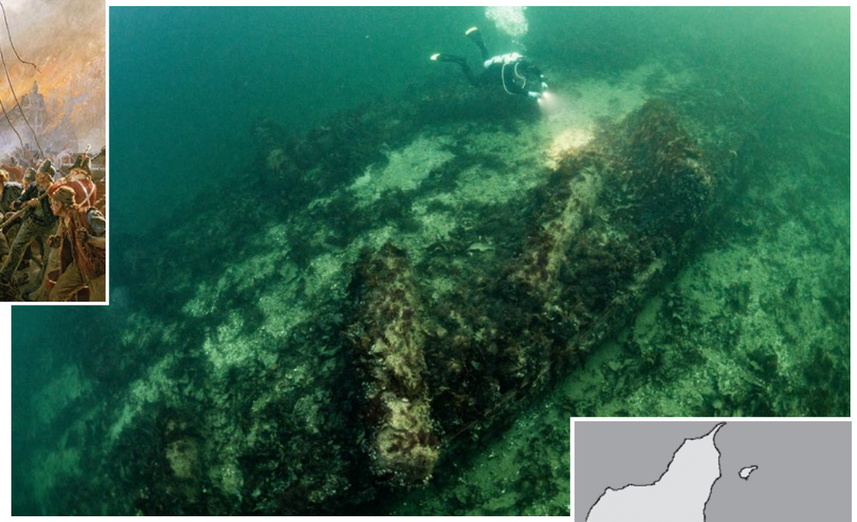
Fløyte Træ Vrag (Dutch Fluyt)

The fluyt was a dedicated cargo vessel designed by the Dutch in the 16th century to maximize available cargo space; it was cheap to build and could be handled by a small crew. This vessel probably sank during the Great Northern War (1700–1721) only 2.5km from the port of Helsingør and the narrowest point of Øresund. The wreck, which lies at a depth of just 16m, was only located in 1994. It has probably only become exposed in recent times and is now at risk of being broken down and consumed by shipworm.

WIKIMEDIA COMMONS / PUBLIC DOMAIN

Floating naval battery during the Battle of Copenhagen. Painting by Christian Mølsted



Sværdfisken (The Swordfish)

The wreck is also known as "Kanonprammen," which loosely translates to "The Cannon Barge." It was part of the line of defence during the battle of 1801, with its position marked on the map on the previous page. Its armament comprised eighteen to twenty 24-pounder cannons. The barge was commanded by second-lieutenant S.S. Sommerfeldt, as it came under fire from HMS *Edgar* and HMS *Ganges*. It burned and sank in a position north of Flakfortet, a sea fort located on the artificially built island of Saltholmrev in Øresund, between Copenhagen and Saltholm. The wreck re-emerged after the construction of the Øresund bridge and tunnel link between Copenhagen and Malmö, Sweden, which probably caused currents and sand to shift about.

Sværdfisken

Marine Archaeology
— Discoveries in Denmark

PETER SYMES

Text and photos by Peter Symes

Trading and transport by sea goes back to prehistoric times. Stone Age settlements and canoes, Viking ships, medieval cogs, fluyts, tall ships, warships, defence systems, jetties, harbour installations and aircraft wrecks—Denmark has got it all.

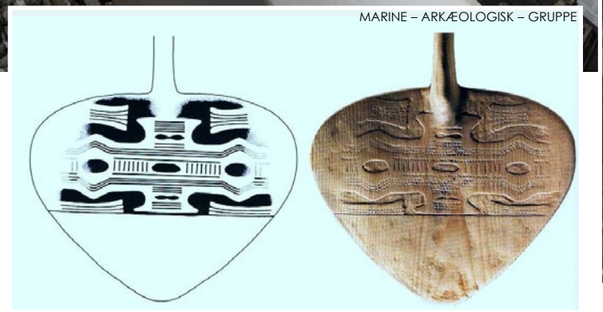
Archaeology is concerned with the excavation, surveying and protection of historical artefacts, both on land and under the sea. The findings provide an important key to our understanding of shipbuilding traditions, trade and life in the past, and political and military confrontations.

Two important and frequent types of finds made underwater in Denmark are Stone Age settlements and shipwrecks. Denmark has been populated since the glaciers retreated after the last ice age. At that time, the geography was much different, and the country was unrecognizable from the outline it has today. Nine thousand years ago, the sea surface was 30m lower than it is today because of the ice age.

What is now the Danish west coast and eastern North Sea shoreline was connected to Britain as big swathes of the North Sea were dry land that were settled by Stone Age communities as described in our feature "The Drowned Lands of Doggerland," published

THE VIKING SHIP MUSEUM IN ROSKILDE

The unfinished amber amulet has clear incisions and a drilled hole.



MARINE – ARKÆOLOGISK – GRUPPE

Decoration on Stone Age canoe paddle (reconstruction)

MARINE – ARKÆOLOGISK – GRUPPE

A Stone Age fishing hook sticks out of the bottom of the Gamborg fjord, a sidearm to Lillebælt (Little Belt)

PETER SYMES

Storstrømmen and the bridge from 1937, which is corroding and going to be replaced with a new one.

Storstrømmen is the strait separating the islands of Falster and Zealand.

Musings on a Visit to the Viking Ship Museum

Text by Catherine GS Lim

Vikings. As someone who grew up surrounded by sedate concrete buildings in a meticulously planned urban environment in Singapore, I knew very little about them. I had never learnt about them in school, nor were they part of my usual literary diet (well, barring Hagar The Horrible).

Thus, as the car I was in neared the Viking Ship Museum in Roskilde, I felt some degree of agitation. Was I headed for an afternoon filled with crippled ships with broken masts, long cannons and blood-ied chainmail? (Hmm, it seems that I had somehow acquired an impression of Vikings being the sort to go around raiding villages in the countryside. I wonder how that happened…)

As soon as I stepped onto the museum premises, the atmosphere was serene and peaceful, yet with an air of excitement and anticipation. Under a cloudy sky, a breeze from Roskilde Fjord brought forth a welcoming whiff. I spotted a boat with a high mast stationed nonchalantly in the waters.

It was fully intact with zero battle scars. Feeling slightly confused, I entered the museum building.

Five Viking ships

The Viking Ship Museum houses the remains of five ships that were deliberately sunk around 1070 to serve as defence against enemy forces and to block the fairway. Known as the Skuldelev ships, they were excavated in 1962. Today, around 950 years later, they serve as a testament to the ingenuity and resilience of the Viking people.

To think that such massive (and sturdy!) ships could be built using simple hand tools without any Industrial Age machinery. And that the hulls of the ships (barring some missing strakes and disintegrated wood portions) were still fairly intact to this day… To say that I was amazed was an understatement.

Viking life

As the afternoon drew on, I learnt more about the living conditions on the ships and the life within the Viking community. I ventured out into the outdoor yard where visitors could try their hand at the different shipbuilding techniques. All aspects of seafaring and shipbuilding were covered. There was even a replica of a Viking ship that one could hop on (I did!), and possible sessions to actually ride on (read "row") a Viking ship.

As I left the Viking Ship Museum that day, I came away with a new respect for the Viking people. They were a fearless and proud seafaring people, a strong innovative community with deep-seated values of family and kinsmen. Yes, there were warriors, raiders and conquerors, but beside them lived tradesmen, merchants, farmers, hunters, mothers, fathers, children… just like any other well-developed and structured society. ■

THE VIKING SHIP MUSEUM IN ROSKILDE

Axehead from the "flintworker's workshop"

THE VIKING SHIP MUSEUM IN ROSKILDE

Handle from an axe. It was broken some time during the Stone Age and then discarded.

THE VIKING SHIP MUSEUM IN ROSKILDE

Lower jaw of a red deer. Like many other animal bones found on this settlement, it had been charred by fire.

PHOTO MOSAIC: MASSIMILIANO DITTA AND MATKO CVRLJAK / THE VIKING SHIP MUSEUM IN ROSKILDE

The Kalderev Ship (left), which was found in Storstrømmen, is dated to about 1250-65 AD. The archaeologists use a so-called "orthophotomosaic" technique to produce overviews of the preserved parts of ships "in-situ"(where they are found). This photo mosaic was compiled with over 900 still photos and can also be seen in 3D-footage on the Viking Ship Museum's website.

in issue #61. At that time, the Danish Straits did not exist, as the Baltic Sea was a freshwater lake until 9,500 to 8,000 years ago, when rising sea levels broke through the Dana River, forming the Great Belt.

But as long as people have lived in these changing landscapes, they seemed to have predominantly settled along coastlines and been occupied with hunting and fishing. It also appears that their main mode of transportation was by water.

Around 7000 BC, the ice melted rapidly. Coastal settlements were flooded and were gradually covered by protective layers of sediment, providing good preservation conditions for tools and other artefacts of perishable materials. That is why many well preserved items of wood are found underwater, whereas they are seldom preserved on land. Hence, a large part of the cultural heritage has been found underwater where artefacts have lain protected in the seabed, often for millennia, awaiting their discovery by professional or amateur archaeologists.

Archaeologists estimate that the remains of some 20,000 Stone Age settlements are to be found in Danish coastal waters. Many such settlements have been found during field surveys conducted prior to extensions of ports, building of bridges and other infrastructure projects. For instance, one was found right under the most popular beach in Copenhagen, Amager Strand, and recently, another one was discovered right outside the leisure boat marina in Tuborg Havn (harbour). Other surveys, such as the transects performed prior to laying down

VIKING SHIP MUSEUM IN ROSKILDE

Battle of Fehmarn Belt 1644, 17th c. painting by Jan Van der Velde (above); This shipwreck (top right), located in just 3.5m of water off the southern coast of Lolland, is probably that of the Danish warship *Delmenhorst*, which burned and sank during the Battle of the Fehmarn Belt in 1644; Cannonballs have been found in four different sizes for the ship's cannons, as well as exploded pieces of cannons and musket bullets (lower right inset).

Fehmarn Belt is the strait separating the Danish island of Lolland from the German island Fehmark.

cables or pipelines, have often also stumbled right into ancient wrecks.

Protected artefacts

Stone Age settlements, shipwrecks, defence systems, jetties, harbour installations and aircraft wrecks are artefacts of great historical importance and are therefore protected under the Danish Museum Act. As such, it is exclusively professional marine archaeologists from the museums who may investigate and excavate submerged relics. Everyone else may only observe and take photographs but not touch.

To a large extent, this requirement just makes sense. But the rigid way it has been interpreted or administered in the latter years has prevented qualified members of the engaged amateur archaeological community to continue to assist and work under the supervision of the professional archaeologists and museums. As there is a dire shortage of professional underwater archaeologists, this has frequently also led to situations where amateur archaeologists were left frustrated that they were not allowed to salvage artefacts, which have become exposed and in risk of destruction.

Marine-Arkæologisk-Gruppe (Marine Archaeology Group) is such a group of dedicated amateur marine archaeologists, which deserves a special mention in this regard. It is a dive club based in the town of Kolding, and one of the member clubs of the Danish Sportdiver Federation (DSF). This group, which has extensive expertise and experience in this field, has over several decades made several significant archaeological findings, which have been described in the relevant peer-reviewed scientific journals. For example, it was their discovery that Stone Age canoe paddles were decorated with intricate patterns - see page 36.

Finds in Eastern Denmark

In the eastern part of Denmark, it is the Viking Ship Museum that holds the responsibility to safeguard all archaeological artefacts and to conduct surveys and excavation of sites of interest.

The direct route between Copenhagen and Germany is a road and rail link that crosses Storstrømmen—a strait between the islands of Sjælland (Zealand) and Falster. The old bridge that carries the railroad over the strait dates from 1937 and is about to be replaced with a new bridge, which will cross an area where important finds have been previously made.

MORTEN JOHANSEN / VIKING SHIP MUSEUM IN ROSKILDE, DENMARK

Archaeological investigations soon discovered an 8,000-year-old settlement under 5m of water in Storstrømmen, with large quantities of rare artefacts and exceptional preservation conditions. When the settlements were inhabited, Storstrømmen was a deep valley with running streams and wetlands, and the maritime archaeologists found a rich assortment of animal and fish bones that indicated that people lived on resources from both the forest and the sea.

In conjunction with the same investigations prior to the construction of the new bridge across Storstrømmen, a Medieval ship from the 13th century was also discovered, which may provide a missing link between the slender Viking ships and the bulkier vessels of the Middle Ages, which could carry more cargo.

Farther south and along the same road and rail link to Germany, a tunnel is to be constructed across Fehmarn Belt connecting Denmark and Germany, which will replace the current ferry link between Rødbyhavn and Puttgarten.

Battle of Fehmarn wrecks

Already during early surveys in 2012, archaeologists discovered the wrecks of Lindormen and Swarte Arent—both lost during the Battle of Fehmarn (1644), which took place northwest of the island of Fehmarn. It was in this battle that a combined Swedish-Dutch fleet resoundly defeated a Danish fleet. The Danes lost twelve ships, of which ten were captured.

The Swedish fire ship Meerman was sent against the Danish Lindormen, which quickly caught fire and exploded. Swarte Arent was a Dutch ship and the only vessel that the combined Swedish-Dutch fleet lost. Both wrecks have been located at a depth of 24m in the middle of Fehmarn Belt and were found to be in "excellent condition."

Archaeologists also made finds from daily life on the ship, including a calculation coin (right), a flat coin used as a simple but effective type of calculator at the time.

MORTEN JOHANSEN / VIKING SHIP MUSEUM IN ROSKILDE, DENMARK

In more recent years, yet another shipwreck from the Battle of Fehmarn—the remains of the long-lost Danish warship Delmenhorst—have been discovered in just 3.5m of water and just 150m from the shore of the southern coast of the island of Lolland in Denmark. It is the last Danish sunken ship missing from the fateful battle. The Delmenhorst was intentionally grounded near Rødbyhavn, in the final hours of the battle, because the Danes hoped to defend it using a massive cannon in the harbour town.

These finds are but examples of the sites and wrecks that have been discovered during field surveys taking place ahead of just one infrastructure project. ■

PETER SYMES

M/F Ærøsund: From Ferry to Artificial Reef

Text by Peter Symes. Photos by Peter Symes & Lars Stenholt Kirkegaard

M/F *Ærøsund* is a former ferry that served the islands in the South Funen archipelago. It was scuttled in 2014 in a sheltered bay just 550m off Funen's southern coastline where it now rests at a depth of only 19m. It is easily visible from the surface.

I remember attending the sinking, which was a much-hyped media event. News helicopters were whizzing about like giant wasps and an armada of leisure crafts encircled the ferry, which was anchored in its designated sinking spot, awaiting the scuttling. We were far out in the countryside and had to go down many small winding side roads to make it to a camping ground in the south-eastern corner of the island of Funen (or "Fyn," in Danish)—a short distance west of the lovely town of Svendborg.

As we sat there on the beach squinting in the bright sunlight, we were among quite a crowd, some of which had brought camping chairs and tables, making a right picnic out of the event and entertainment. At the top of the hour, in the early afternoon, a siren tooted signalling that the sinking has commenced. I am not sure if some explosive charges went off or some plug was pulled, but nothing much appeared to be happening.

We were standing up squinting even harder now to make out what went on those 550m out to sea. Was it sitting deeper in the water now? Was it listing? We were literally on our toes, anxious not to miss any of expected spectacle when it went down. We stood there, with our gazes fixed on the ferry in the distance for 5, 10, 20 minutes, without seeing any movement, after which our calves started to hurt, and we sat down.

Then, after some 45 to 50 minutes, the vessel appeared to list a bit and was sitting deeper, albeit hardly noticeable. Next, within a few moments, it started to go down fast, some sprays of mist were ejected from the innards and suddenly it was gone. It went under so fast and without any of the hoped-for drama that it caught us by surprise. It was a bit of an anti-climax. However, we did witness it, and it was otherwise a wonderful day to be out and about.

LARS STENHOLT KIRKEGAARD

The sinking of the *Ærøsund* ferry (right) in 2014 was a big media event in Denmark, with a large public audience in attendance as well as numerous ships and sailboats (above); Diver on the *Ærøsund* wreck (left and below)

LARS STENHOLT KIRKEGAARD

SDU

To see a cool video of the sinking of the *Ærøsund*, click below image: **youtube.comwatch?v=pjBRtVOaJfI**

LARS STENHOLT KIRKEGAARD

Objectives

The purpose of scuttling the ferry was to improve the natural environment by creating a new reef in an area that lacked any reef formations—the surrounding seabed was soft and rather featureless. The other objective was to create a unique setting for safe training in diving and penetration of shipwrecks. Being the only location of its kind in Denmark, it was expected to be highly sought-after by dive clubs and dive shops offering dive training.

Another of the stated objectives was to stimulate a much-needed development of local coastal tourism by attracting both Danish and foreign diving tourists—particularly during the off-peak season. Also mentioned as a purpose was communicating local maritime cultural history in an innovative way—a point in which I, however, fail to see the logic.

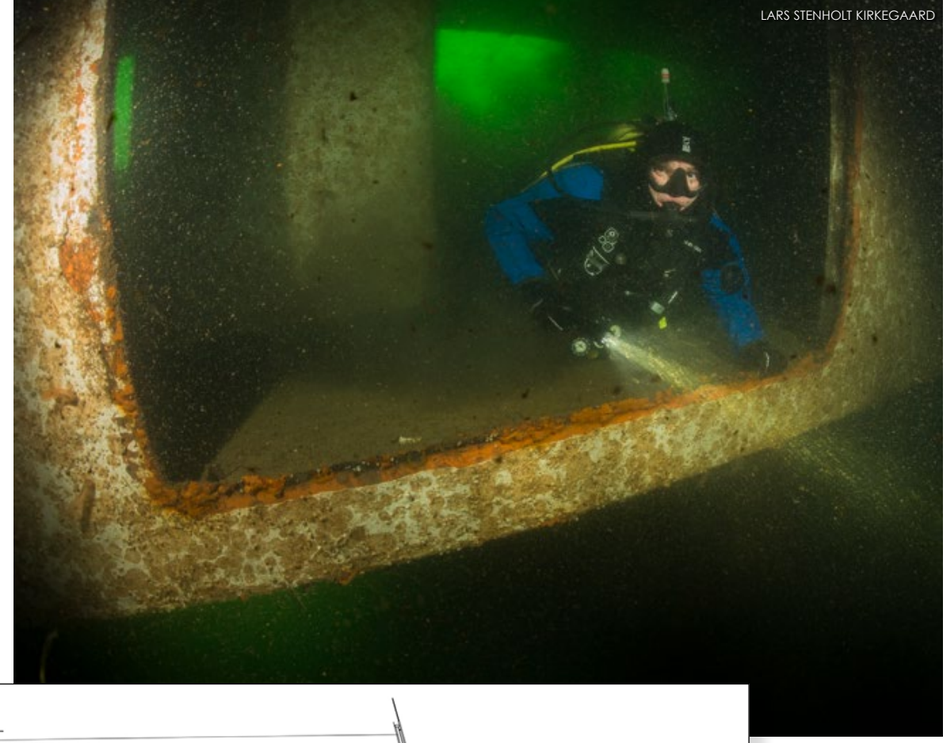
Diving the wreck

Diving the ferry is as straightforward as it gets, as it lies perfectly upright in a sheltered area, well away from shipping lanes and much boat traffic. One just needs a boat ride, say, with a dive centre or a club.

I suppose the 550m from the coast to the wreck and back could be swum by a fit diver on a calm day. However, I would not recommend being without the support you can get from a boat in case something does not go according to plan. Over half a kilometre is a long swim in case of an equipment malfunction, unforeseen change in weather for the worse, or being in some sort of distress.

A big buoy is chained to the wreck, which is easily visible from above. The ship's funnel reaches up to just 6m below the surface. The shot line under the buoy leads down to the foredeck, right in

LARS STENHOLT KIRKEGAARD



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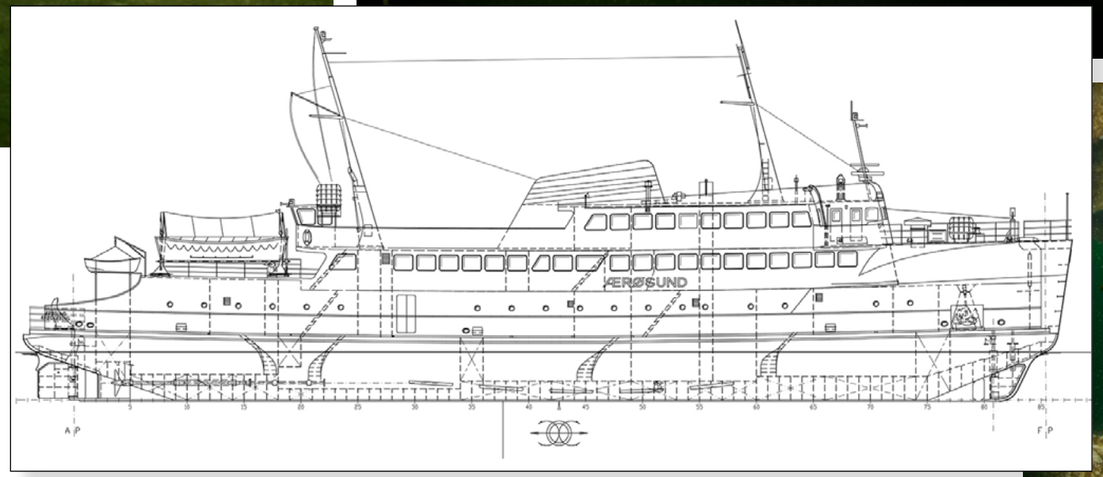
THIS PAGE: Scenes from a dive on the *Ærøsund* wreck



Denmark

FACT FILE

M/F *Ærøsund* was a Danish ferry, which served the route between Ærøkøbing and Svendborg from 1960 to 1999, after which it was replaced by a modern ferry. *Ærøsund* was built by Husumer Schiffswerft in Germany, as build number 1118 and launched in 1960. It was rebuilt in 1970.

Length: 55.26m
Width: 9.32m
Height (without masts): 13m
Tonnage: 396 BRT
Deadweight: 221 ton
Engines: 2 x Mak Mau 423, 800 HP
Speed: 13 knots
Passengers: 700
Cars: 40

LARS STENHOLT KIRKEGAARD

front of the wheelhouse, which is a good point to start exploring the wreck. The car deck, which also has rails for trains, is wide open and can most easily be entered through the bow port, which is a big opening.

Caution

In this regard, a piece of advice here is pertinent: As fine silt has accumulated inside the car deck, caution must be exercised when entering, because of the risk of a silt-out, in case this sediment gets kicked up, which can lead to losing sight of an exit and disorientation. Do not enter if you are not prepared, trained and equipped for such an eventually. If you swim through, stay well clear of the deck and be mindful of not disturbing the silt. It is not just a matter of safety, as it also ruins the visibility for the next diver.

The deepest point is the rudder at 19m, the car deck is at 16m, and the bridge and saloon are at only 12m. As such, it provides plenty of latitude in regard to no-decompression limits and gas consumption. It is a quite uncomplicated dive. That said, one should never slack on any aspects of preparation, equipment and safety, regardless of how shallow or easy a dive may appear.

Decontamination and diver safety

Prior to the scuttling, M/F *Ærøsund* went through comprehensive environmental decontamination to ensure the safety of the wreck for diving. This decontamination abided by a report produced by the environmental consulting group, COWI, based on analyses of all components of the ferry. As a result, the following objects were removed:

- Motors, pistons, screws, propeller shafts, fuel, oil and lubricants.
- Windows and rubber mouldings, floor linoleum, insulating material and doors.
- Tiles, sinks, toilets, furniture and kitchen appliances and equipment.
- Asbestos, cables, lead ballast, electronics and hydraulics, wood covering and car deck sealants.
- Bottom paint containing TBT and tar from the sides and walls of lounges and rooms below deck.
- Any loose paint, and most of the ferry's outer paint matrix.

In addition to these items being removed, large holes were carved into the ferry's deck, sides and bulkheads, creating entry and exit points for divers. Selected stairs and walls were also removed for the same reason.

In total, the ship was stripped of more than 100 tonnes, including the motors, which are currently in use on the other side of the globe. Following the decontamination process, more than 300 tonnes of sand was placed into the bottom of the ferry in order to trim and stabilise it. ■ SOURCE: DESTINATION SYDFYN

Plumose anemone on the *Hven Prammen* wreck

Denmark's Øresund & Isefjord

Text and photos by Morten Bjørn Larsen

Diving in Denmark, how does it really measure up? As one of my good friends and diving partners usually says: We are lucky with a lot of things living here in Denmark, but if you like cycling in the mountains, skiing or diving in warm waters... then you are not super well-placed as a Dane. I myself usually see my dives in Denmark as training, understood in terms that if you can complete a wreck dive in Øresund and come up with a useful picture or two and a big smile on your face, then you are as well prepared as you can be to dive the rest of the world.

When we were struck, as if by lightning from a clear blue sky, by Covid-19, my five to ten dives per year in Denmark suddenly became quite a few more. Due to travel restrictions, there was nowhere else to go but to our own domestic waters where the urge to dive could be satisfied. As a Danish proverb says, there is nothing that is so bad that it is not good for something. By that I mean that in 2020/2021, my eyes have been opened more and more to the fact that there are actually a lot of cool dive sites and different types of diving to be had here—and for my own interest as an underwater photographer, there are a lot of good photo opportunities in Denmark, which I probably would not have discovered, if not we had not been hit by the coronavirus pandemic.

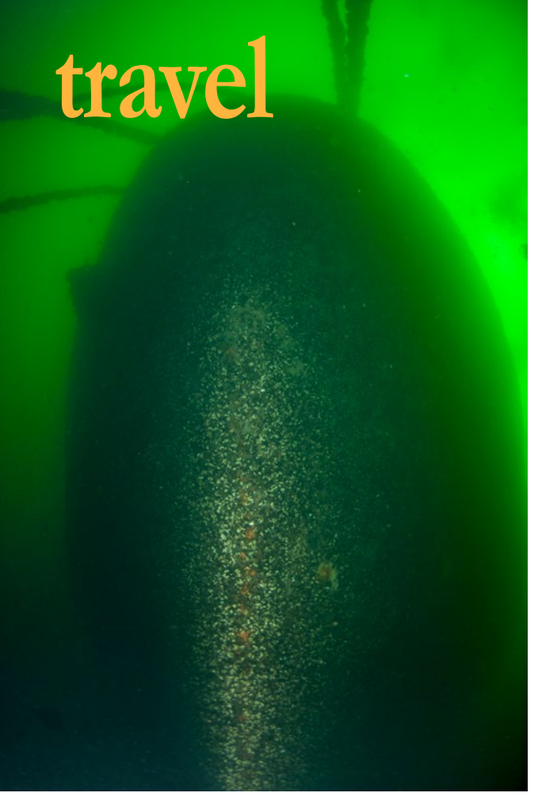
I have always lived in Copenhagen, which is next to Øresund, the strait that separates Denmark and Sweden. Therefore, I naturally do many of my dives in Øresund. But when the weather shows its teeth and it blows too much for diving in Øresund, then the island of Zealand, on which Copenhagen is located, is not so big that you cannot drive a little way north or south to find a beach or a fjord where the wind does not hiss too loudly for diving.

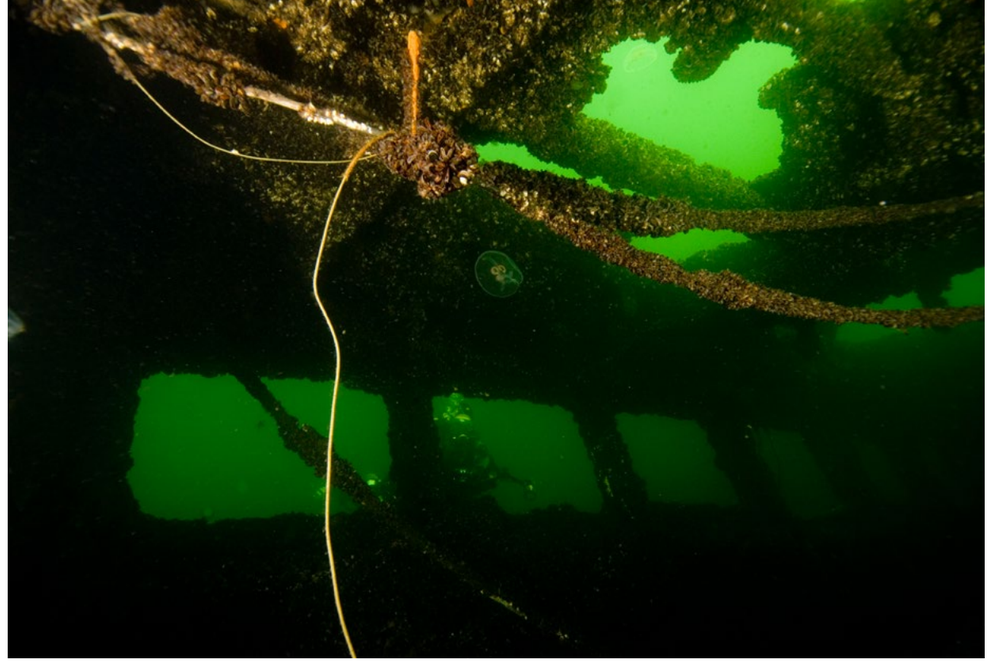
I am not the most experienced wreck diver in Denmark, but I have some favourite wrecks in Øresund—especially one that is actually located so far south in Øresund that one enters the Baltic Sea and and Swedish waters. It is the wreck of *Vapper*.

Vapper wreck

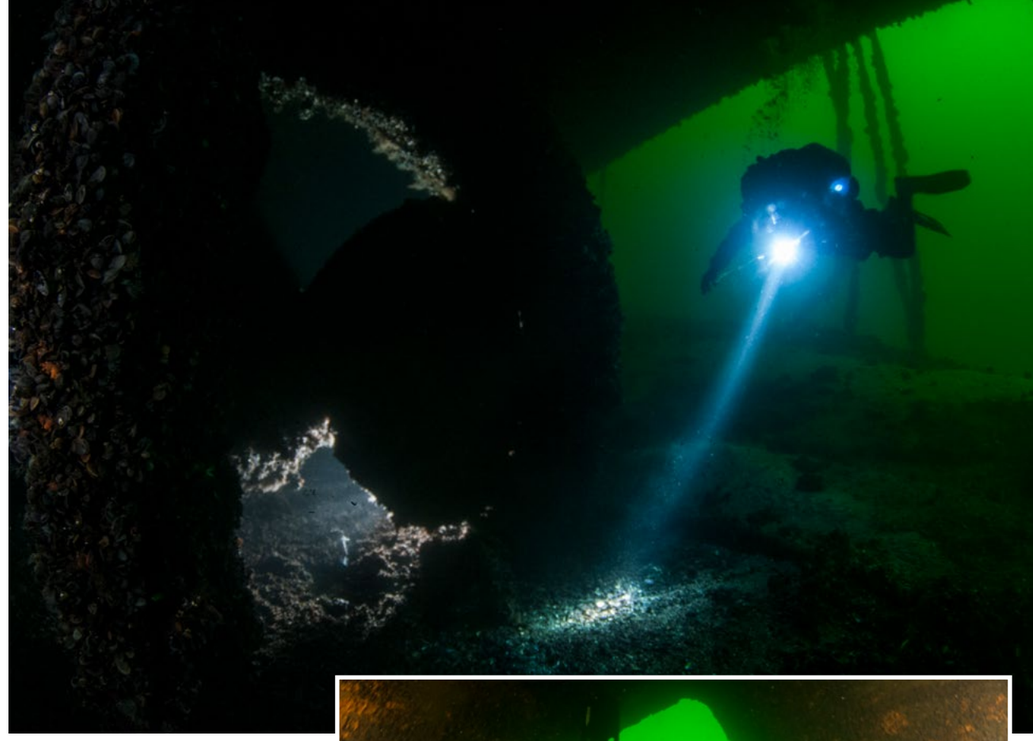
Vapper is a former fishing trawler, also known as a fish factory. *Vapper* was built in Germany in 1974 but sailed for Estonia under the former Russian communist regime. *Vapper* is a type of trawler that was built for the purpose of trawling the seabed, and at the same time, could put the catch directly in the can. That kind of predatory fishing was, of course, by no means sustainable. So, at the same time as the fall of the communist regime in the late 1980s, it was no longer defensible, economically or environmentally, to have these fish factories in operation. Therefore, *Vapper* was sold for scrapping in Dubai.

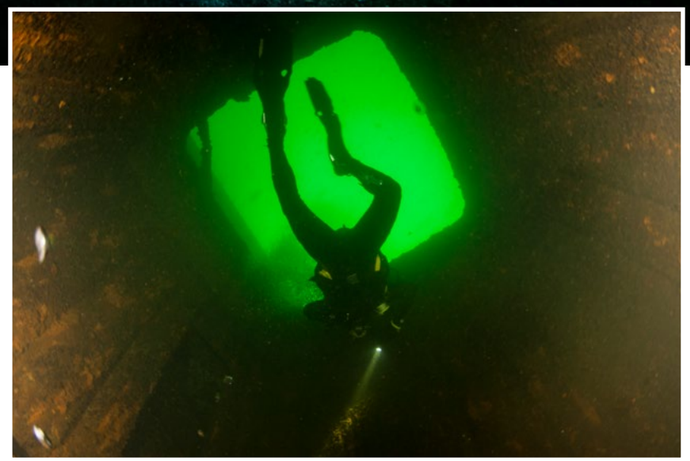
While *Vapper* was being towed towards its final port in Dubai on 19 December 1994, the tow rope broke in





Located in the mouth of the Baltic Sea, south of Falsterbo in Denmark, the *Vapper* is 102m in length and 16m in width.





severe weather. I have heard stories that the Russians had a particular tendency to "lose" their ships on the way during towing—surely after the payment had been dropped... But that might be just a caper story. At any rate, it has at least provided us with a really good wreck to dive.

Diving the wreck

From 1995 to the year 2000, diving was banned on the *Vapper* wreck, due to the danger of oil spills. In the early years, it was easy to find the wreck as the top of the masts still stuck a few feet above the water. However, the first time I dived the *Vapper* in 2007, they were removed. But to the top of the bridge, which was only at six meters depth, clear markers had been tied. *Vapper* is truly a Donald Duck type of wreck, standing upright on the sandy bottom. And with the top at six meters depth and the bottom at 25m, *Vapper* can be dived by most people with a hankering for a good Danish wreck dive.

It is a large wreck, so I always recommend doing at least two dives on the same day. I once tried to do it in one dive once, when the viz was about one meter, and it was a shame, of course, because then the first-time *Vapper* divers could not get the right "wow" feeling for the size of the wreck. But apart from that one day of bad visibility, I have mostly experienced fairly good visibility, for Danish waters, to be something like 10 metres. In terms of relatively decent visibility, wind and weather, these were dives we did in September and October.

If you take a tour around the wreck, there is plenty to look at. The chute in the aft deck, where the large nets filled with the day's catch were once hauled up, is a beautiful sight. If you swim over the edge of the chute and down to the bottom, you will find the screw propeller, which protrudes, free of the sand, at a depth of 24m.

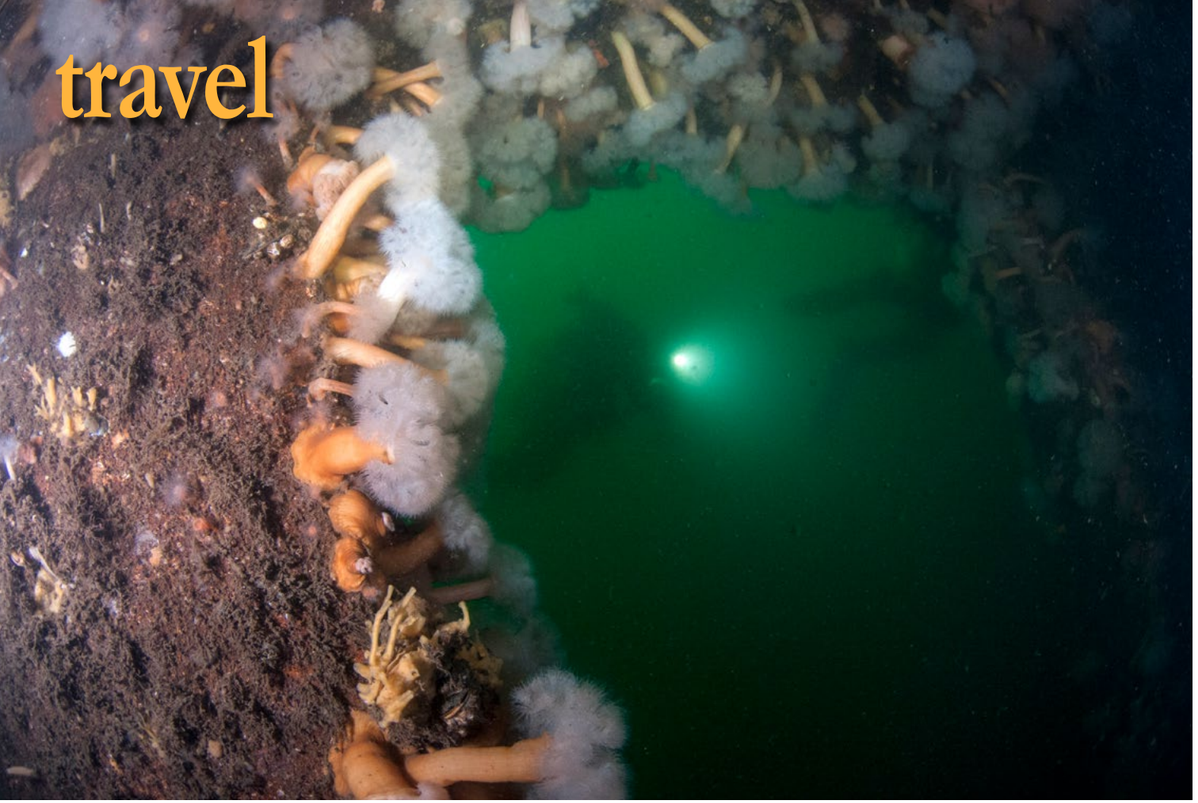
Vapper wreck

Underwater photography. If you like to take pictures, then the whole area down by the propeller is a good place for subjects. I once spent most of a dive placing a flash behind the propeller, while I, at the same time, from the opposite side of the propeller, tried to take photos of a diver in silhouette against the green water around him. It worked out fairly well, but it is actually a picture I would very much like to go back and try to do better.

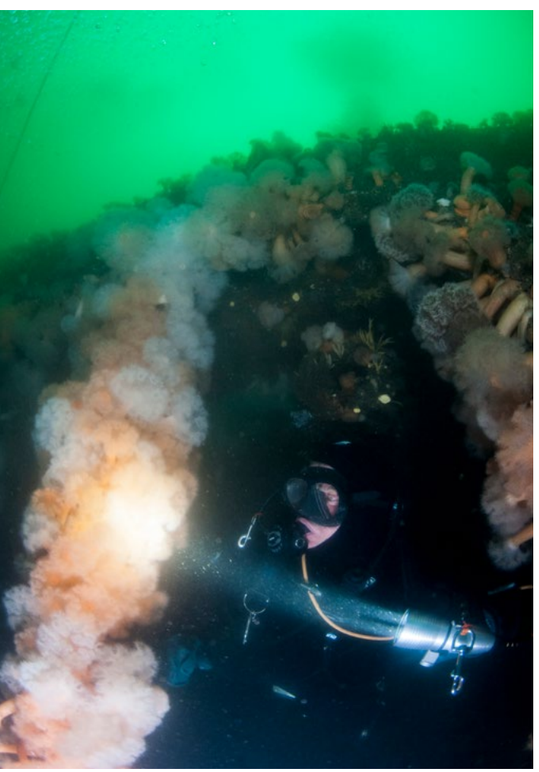
Aft deck. In the aft deck, you can find some descent holes that lead down to the fish factory itself. In the fish factory, you will find the equipment that was used to get the catch ready for resale. You must, of course, have a couple of good dive lights with you down there, and be careful not to kick up too much silt. But it is definitely a fun experience to see the old conveyor belts and refrigerators and freezers down in the fish factory.

Wheelhouse. Even if you are not certified for wreck penetration, you can easily get into the wheelhouse and look around. It is not dark in there, both since it is not deeper than about 10 meters and also because the hatches and doors have been removed so that natural light can better penetrate the space. Considering *Vapper*'s size, there are definitely many other penetration options that I still have yet to try. But it will have to wait until sometime when I can dive *Vapper* with someone who knows the interior well enough that it is safe to make the trip through the wreck's interior.

Deck. Up on the deck itself, you will also find big game, the remains of davits and two large funnels, plus many other interesting details. Large parts of the wreck are covered by a layer of mussels, which



Plumose anemone colonies on the *Hven Prammen* wreck



Diver in the *Hven Prammen* wreck in Øresund

is very characteristic of the Baltic Sea. If the visibility is good, you should also try descending to kneel on the bottom, looking up towards the bow. It is a beautiful sight to see the wreck towering up against the light.

Hven Prammen

Another one of my absolute favourite wrecks, *Hven Prammen*, is located in Øresund itself. When you reach its position, the sonar scanner will show quite clearly that it is a barge. A completely square formation appeared on the screen, when our dive boat maneuvered over the *Hven Prammen* to drop anchor. I thinks it gives you a little extra excitement and desire to descend and explore the wreck when you have just seen a clear outline of the wreck you are about to dive on.

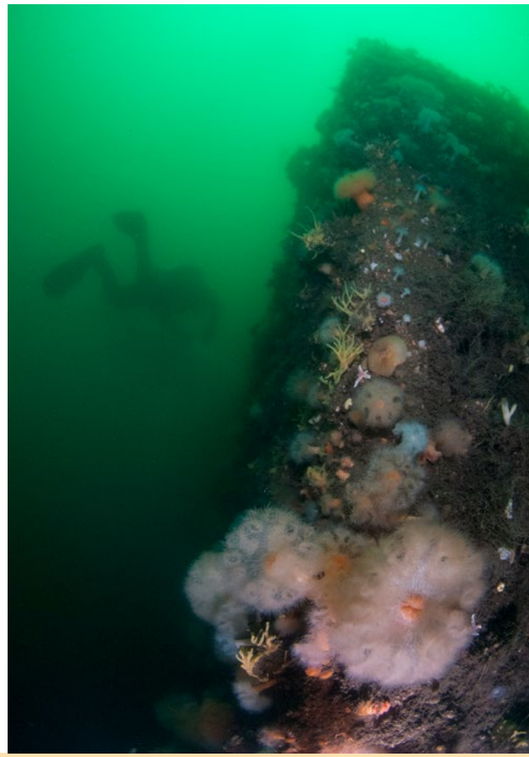
If you have to dive with a large camera, we have learned from experience that when there is current in Øresund, it is clearly best to let others without a camera—or in other words—with free hands, to go first to tie on, and then you descend as the second or third team member. We have, of course, clipped our cameras to a D-ring on our vests, so we will be able to use our hands without losing our lovely hobby toys, in case a situation arises when both hands are needed. But as a starting point, I would rather hold onto my camera gear while descending down an anchor rope in current. The actual process of attaching a line to the right place on a wreck in Øresund, where visibility is not always super, is also just a little more cumbersome with a large camera in tow.

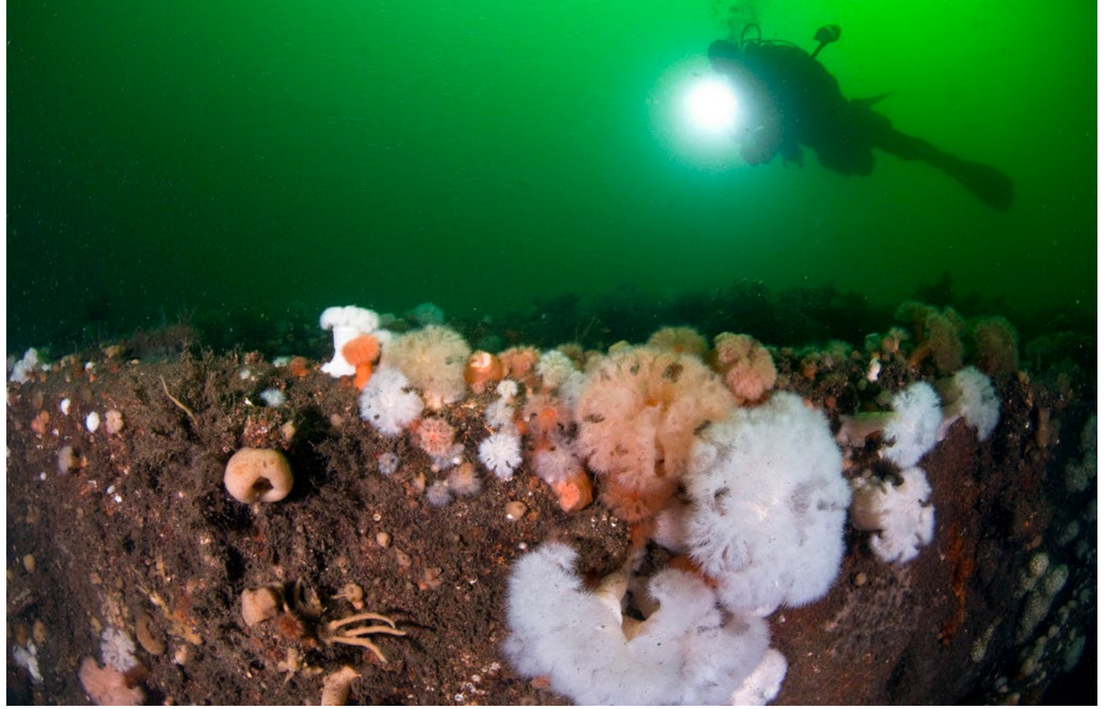
Hven Prammen wreck

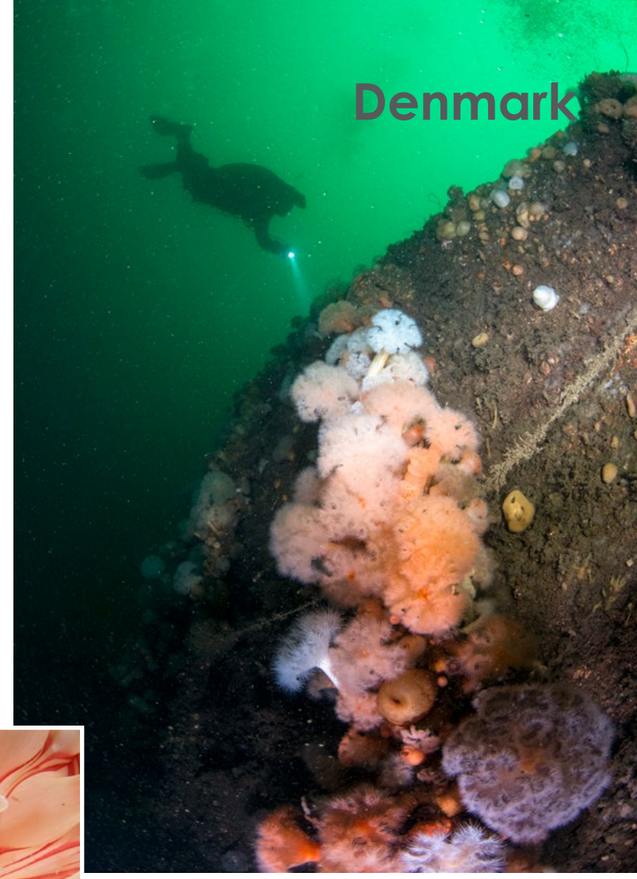
When you start descending to the wreck, it may require a bit of fin work to get down to *Hven Prammen* without pulling too much on the anchor. *Hven Prammen* begins at a depth of about 20m, but already at 15m, the current often disappears. It is really nice to be able to relax and enjoy the wreck, which appears before you, at the end of the anchor. At this point, it can be very nice to take a brief pause, still tied to the downline, just to adjust your camera settings and the flash, before you continue diving further.

Navigation. From the sonar image, you can see that if you follow the wreck around its hull, then you simply have to turn when you encounter a 90-degree angle. That way, you will always end up back at the anchor, after the fourth turn. It can be a safe way to navigate, if it is a day when visibility is not as good. But if you hit one of the good viz days in Øresund, you can easily explore the wreck a little more.

If you descend to one corner of the wreck, you will see that it is overgrown sporadically with frilled anemones, while, at the same time, metal surfaces are also visible. It is very similar to a huge box right







Denmark

Diver on the Anemone Wreck, which is a barge (above and top right); The bow (top left); Close-ups of anemones (right and left); Red rockfish over colony of plumose anemone on wreck (below)

there in the middle of the sand. If you swim a little farther, around the next corner, some large columns appear. These columns go from the bottom and up to the deck. The columns are very nicely overgrown with anemones in brilliant orange, red and white.

Pillars. At the pillars, it is also possible to dive inside and continue up through something that has probably been a cargo hold. After a good photo op at the pillars, continue a bit farther to find some hatch holes that you can easily enter. The growth on the ceiling here is really beautiful. It is not possible to put a hand anywhere on the ceiling without hitting and damaging a dahlia or plumose anemone.

I do not know much about marine biology, so I do not know out why they thrive so well on that ceiling—inside a wreck where there is never an honest ray of sunshine, and well, there cannot be much current bringing nourishment. But it certainly looks nice when you tilt your dive torch to light up the lushly decorated ceiling. Thereafter, it is easy to dive around the last part, and find the anchor silhouetted against the light and the beautiful green water.

Of course, be forewarned, Øresund will never be like Truk Lagoon! But the joy of a good wreck dive in the Øresund and the subsequent coffee and caper stories on the way to the harbour with your dive buddies, is absolutely also top notch!

The Anemone Wreck

The anemone wreck is one of the most visited wrecks in Øresund, and with good reason! The anemone wreck is a concrete barge with a bow, as it is called. The anemone wreck sailed in 1948, and you can see the collision hole in the side of the wreck. It may well be worthwhile to take a look in and around the collision hole, where there are regularly some cod hiding.

Bow. If you take a tour out to the bow, you just have to dive a little into the green and turn around, and take a look at the bow which is covered in a beautiful frilled anemone colors.

Anemone Wreck

Behind the bow, one should also take a good look for rockfish that live on the wreck. I always enjoy seeing the beautiful red fish, which have unfortunately been overfished for a number of years. But as there are now fishing restrictions in place, hopefully they are on their way back to their natural numbers.

Visibility. The best opportunities for good visibility on the Anemone Wreck are in the spring. If you are lucky, you can hit very good visibility around Easter, so you can easily get a good overview of the wreck. But it is also a worthwhile experience to dive the Anemone Wreck in normal Øresund viz. The slightly gloomy atmosphere that bad viz provides, mixed with all the beautiful life that is always on the wreck, is simply unique to Denmark!

CLOCKWiSE: At Munkholm Bridge: Flabellina nudibranch; Diver by the pylons under the bridge; Beach entrance to the dive site; Numerous colourful starfish and masses of shrimp can be found by the pylons.

Munkholmbroen

As previously mentioned, wind or current can be an obstacle to being able to get out by boat in Øresund. Fortunately, this does not have to be a problem in Denmark, because the distances here are not so great that one cannot plan a different kind of dive for the same day, when it was set aside for diving anyway.

One of the places we like to go to when either the weather teases, or we just want a fun shallow dive with good macro subjects, is the Munkholm Bridge that crosses the Isefjord in northwestern Zealand.

Munkholm Bridge

A dive at a bridge pier may sound like something with great depth and a current that can peel the regulator out of your mouth and the mask off your face, but you do not need to fear any of these issues if you dive under or near the Munkholm Bridge. There may be a little current when water is forced into the Isefjord, but it is rarely more than a couple of fin kicks can handle. And the depth at the bridge piers does not reach further than five meters, so there is also no reason to calculate extra air for a decompression stop.

Beach entrance. The dive itself starts at the beach, where you can help one another with dive equipment in peace. If this is the first time you dive at the Munkholm Bridge, it may be a good idea to surface swim to the first bridge pillar—it does not take more than a minute. That way, you do not have to lie down to look for the bridge piers, as you would if you had started diving at the beach.

Pylons. When you dive down along the bridge piers, you will be able to see that each pylon is not cast as a solid block, as it may appear to be from the surface, but that each one stands on top of several smaller pylons underwater. This provides just the right amount space to be able to swim through the bridge piers. If you want to lie down and play with swimming through the pylons, be very careful, because there is a myriad of life in the

At Munkholm Bridge: Skeleton shrimp (above); Diver under the pylons (top center); *Eubranchus rupium* nudibranch (right)

Marine isopod on anemone (right); Crab feeding on small fish (left)

spaces in-between, which can easily be damaged by a fin or other contact.

Even if you dive in broad daylight, a dive torch or light is a good idea. Not because it is dark in such shallow waters, but because the cone of the dive light can reveal a lot of small critters. On the pylons themselves, thousands of sea urchins, plumose and dahlia anemones grow. Inside the holes, shrimp live—so many that in autumn and winter, it looks like an anthill of shrimp. If you look around the bottom of the pylons, there are starfish sporting all the colours of the rainbow. But perhaps the most beautiful are the yellow corals called dead man's fingers. Crabs, viviparous eelpout and especially cuttlefish glide merrily around everywhere along the bottom.

If you have time, you can dive all the way to the shore. Towards sunset, the bottom begins to come alive. Just before you reach the shore, there is a belt of seagrass, which is also a good idea to investigate, as there is a lot of life hidden in the grasses.

Greener future

Danish waters have for many years been hard pressed by fishing, dredging and discharge of toxic wastewater. But in recent years, from many sides, many good and important projects have begun to be launched, for the protection, conservation and reconstruction of our seas around Denmark.

WWF-Denmark has worked intensely to remove the many ghost nets, so that they no longer lie as eternal death traps on the seabed, wrecks and rocky reefs.

In 2008, the state placed 10,000 tonnes of rock from Norway onto the seafloor, northeast of the island of Læsø, to re-establish a rocky reef. Biological studies carried out by DTU Aqua (National Institute of Aquatic Resources at the Technical University of Denmark) and DCE (National Center for Environment and Energy) have found that today there are far more fish species and benthic animals at Læsø than there were before the re-establishment of the rock reef. The project is called Blue Reef and is led by the Danish Nature Agency.

In March 2021, the Danish Fisheries Association, in collaboration with the Danish Society for Nature Conservation, made a proposal to the government to protect ten percent of the marine areas of the North Sea, Baltic Sea and Skagerrak as a totally protected area. The purpose of the proposal is to cater for both sustainable fishing and nature areas.

Øresund will soon be designated a marine protected area under the EU Marine Strategy Framework Directive. At the same time, there is talk that the entire Øresund area should be a Danish/Swedish naval park. Which means that the ban on bottom trawling from 1932 onwards will be rooted in environmental legislation in the future.

So, not only will these projects, plus many others, give the sea peace to recover, we will also have cleaner and clearer water to dive in, with many more animal species to see and experience. In the future, hopefully many more divers from abroad will also want to come and try submerging their heads in our beautiful green waters! ■

A mix of rooted vascular aquatic plants, potamogeton species, Canadian pondweed and hornwort species (seen in this image) stabilises the lakebed of Slåensø, provides oxygen through photosyntesis, and constitutes a physical habitat for fishes, amphibeans and insects.

Picturesque setting of Slåensø, which is located in the Lake Highland region of Jutland

Denmark's Slåensø: Freshwater Diving

Text by Peter Symes. Photos by Peter Symes and René B. Nielsen

Approximately right in the centre of Jutland, the western peninsular part of the realm, there is a region called Søhøjlandet, which translates to "The Lake Highland." It is a sparsely populated and largely forested area with many lakes, a large part of which make up a reserve.

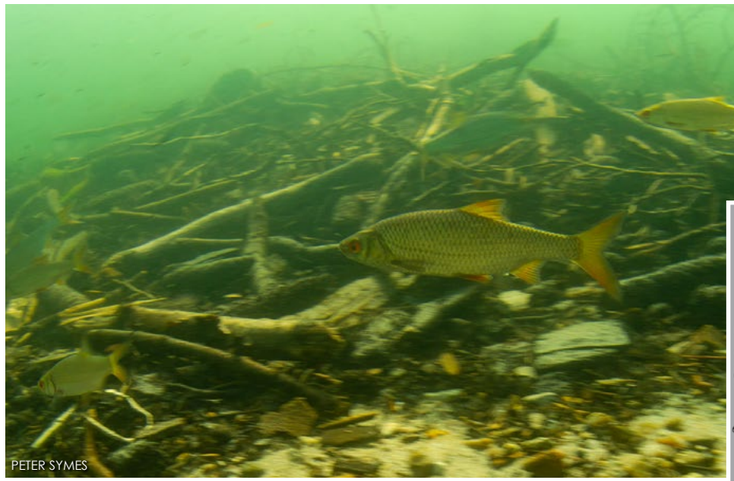
Denoting it as a highland is a bit of an embellishment, causing some Scandinavian brethren in Norway and Sweden, who have real mountains in their outback, to scoff. Afterall, the highest "peaks" are only about 150m above sea level. However, in Denmark, which is otherwise largely flat and predominately farmland, it stands out—and for good reason. It is picturesque!

Generously scattered among rolling hills, which are draped in forest or heath, are plenty of freshwater lakes and they are among the cleanest and clearest in the country.

Somewhat tucked away inside the hilly terrain of the Sønderskov wood, we find Slåensø. It is the cleanest lake in the country and its water is drinkable, as the local tourism office likes to point out. The only inflow to the lake comes from a few springs in the southern end, and since it is in a forest and a good distance from farmland where there is run-off from agriculture (which can leach into the lake), no pollutants can get into it.

The springs also give the lake its name. The Danish term "sø" means "lake," so Slåensø means Slåen Lake. Originally, it was called Slaugen Sø, and the term "slaugen" comes from the Old Norse term "slagna," meaning "springs."

The lake, which is about one kilometre long and 275m at its widest point, is also known for it is high biodiversity of fish, insects, reptiles, amphibians, plants and more. In particular, it is known for its rich and varied aquatic flora. It is one of the only locations in the country where you can find all the species of aquatic vascular plants in Denmark, of which there are some 70 to 80, depending on which source you consult.



Roach (*Rutilus rutilus*) mostly inhabit freshwater ecosystems that are somewhat vegetated, because its larvae and young fish are protected by the vegetation and the mature fish can use it for food.

Slåensø

Potamogeton natans, commonly known as broad-leaved pondweed, produces both floating and submersed leaves on the same plant (see first image in this article).

About vascular plants

A vascular plant is any one of a number of plants with specialized vascular tissue. The two types of vascular tissue, xylem and phloem, are responsible for moving water, minerals, and the products of photosynthesis throughout the plant.

This sets them apart from kelp, which we encounter in saltwater. Kelp is large brown algae, and what appears to be its roots are holdfasts, which lock onto substrates made of rock, or cobble.

Although it functions in this way like a root, a holdfast does not absorb nutrients, and kelp has no vascular tissue.

Eurasian watermilfoil (*Myriophyllum spicatum*) has slender stems up to 250cm long.

Gotcha! Grass snake (*Natrix natrix*) captures a common frog (*Rana temporaria*), which is having a really bad day.

Vascular plants play a crucial role in freshwater lake ecosystems by transporting oxygen from photosynthesis to their roots, where it diffuses into the sediment or lakebed. This oxygen has two important effects. Firstly, it enables aerobic decay of organic matter, which sinks to the bottom, by microorganisms that use oxygen in their metabolism. By contrast, anaerobic breakdown is what we see in oxygen-depleted lakes, where the lakebed is smothered in thick layers of black loose sediment, which releases bubbles of "swamp gas" that smells like rotten eggs when you poke a stick in it. The unpleasant smell comes from hydrogen sulphide, which is a by-product of anaerobic metabolism.

The vascular plants not only sustain aerobic breakdown but also oxidise the top layer of the lakebed, creating a crust-like layer, which seals off any underlying composing matter and prevents the breakdown of this layer from consuming oxygen in the water column. The images in this article show how the lakebed is brown and firm, and not black and loose.

Habitat

The plants also create a habitat and hiding places for fish and their fry, as well as aquatic insects. Here, we can also find amphibians and reptiles, both of which are threatened and protected. It was probably pure serendipity, but on my latest photoshoot, a grass snake (*Natrix natrix*), also known as a water snake, caught a frog right before my very eyes. The grass snake is a Eurasian non-venomous colubrid snake that feeds almost exclusively on amphibians.

Along the banks there are patches of water lily and potamogeton species, which are rooted in the lakebed, with leaves and flowers floating on or emergent from the surface.

Water lilies are rhizomatous herbs. A rhizome is a modified subterranean plant stem, which runs underground horizontally, sending out roots and shoots from its nodes. Rhizomes are also called creeping rootstalks, or just rootstalks, and they are high in starch.

Of potamogeton, there are about a dozen species in sizes ranging from large (stems of 6m or more) to very small (less than 10cm). The predominant and most recognisable is floating pondweed, *Potamogeton natans*. However, many of these species are difficult to tell apart, and their tendency to hybridise does not make a botanist's life any easier.

Pondweed & hornwort

Among the stems of lilypads and potamogeton, we can find clusters or mats of Canadian pondweed and hornwort, both of which are invasive species.

Canadian pondweed (*Elodea canadensis*) is a popular aquarium plant. It came to Europe, allegedly via a load of timber imported to the United Kingdom from Canada around 1836, and in a little over a century, it has managed to spread over the entire European continent.

Water lilies do not have surface leaves (lily pads) during winter but set new shoots from a perennial rhizome in the lakebed.

European perch (*Perca fluviatilis*) is a predatory species.

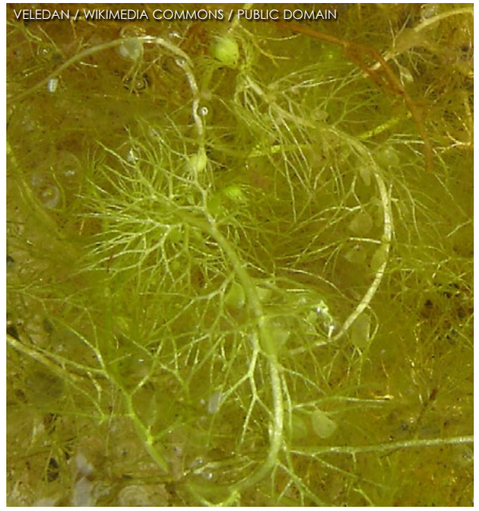

PETER SYMES


ARNSTEIN RØNNING / WIKIMEDIA COMMONS / CC BY 3.0

PETER SYMES

A tuft of hornwort (*Ceratophyllum sp.*) among roots and stones (above); Bogbean (*Menyanthes trifoliata*) sometimes creates big quagmires with its thick roots. It has a characteristically strong and bitter taste, which can be used in akvavit, also known as snaps (left).


CHRISTIAN FISCHER / WIKIMEDIA COMMONS / CC BY-SA 3.0


VELEDAN / WIKIMEDIA COMMONS / PUBLIC DOMAIN

An intriguing species is common bladderwort, *Utricularia vulgaris,* which is a free-floating plant that does not put down roots. It sets delicate yellow flowers, which bely the fact that the plant is carnivorous. It catches small organisms with its tiny bladder-like traps, which appear as small nodules among the finely pinnately-divided leaves. Triggered by protruding hairs on the door, the trap bladders open in about 0.5 milliseconds, sucking the animal in, and closing in about 2.5 milliseconds, operating at speeds that rank among the fastest plant movements known.

Aahhhh! It is nice with some peace and quiet. One thing is for sure, one will not get blown out in this spot (top left).

Hornworts, *Ceratophyllum sp.*, have stems that reach lengths of 1 to 3m (3 to 10ft), with numerous side shoots making a single specimen appear as a large, bushy mass. It grows completely submerged but can often be found floating on the surface in dense mats. The plants have no roots at all, but sometimes they develop modified leaves with a rootlike appearance, which anchor the plant to the bottom.

Fish

Pike (*Esox lucius*) has a very typical hunting behaviour. It lurks, perfectly still among the foliage. Before striking, it bends its body and darts out to the prey, catching its prey sideways in the mouth.


RENÉ B. NIELSEN

Pike lurking in the vegetation. They are typical ambush predators, lying in wait for prey.


RENÉ B. NIELSEN

A canopy of lily pads against the canapy of the surrounding forest


PETER SYMES

The best point of entry is at the eastern end where there is a short path leading down to the lake from the parking lot. Here, there is also a ledge on which to sit while kitting up. A trolley can come in handy to get the equipment back and forth to a car. Otherwise, just walk twice. Carrying both tanks and lead can be heavy. Boats of any kind, including inflatables, are not allowed!

Fish species (not depicted here) frequently encountered in the lake include the common bleak, brown trout, pike and common rudd. The bleak (*Alburnus alburnus*), a small freshwater coarse fish of the cyprinid family, lives in great schools and feeds on small molluscs, insects that fall into the water, insect larvae, worms, small shellfish and plant detritus. Brown trout (*Salmo trutta*) feeds on several animal prey species, with aquatic invertebrates being the most abundant prey items. The common rudd (*Scardinius erythrophthalmus*) prefer clear waters rich in plants feed and hunt for living prey in the upper levels but also feed on aquatic vegetation when the temperature exceeds 18°C. ■

The Bubbling Reefs

East of Denmark's northern tip, and a short trip with a small ferry from the town of Frederikshavn, we find a small group of picturesque islands called Hirsholmene (*holm* means *islet* in Danish). They are surrounded by a shallow archipelago that has been declared a sanctuary, which covers about 2,400 hectares. The islets themselves are just about 45 hectares altogether and a popular day-trip destination for leisure boaters. For divers, it is in the surrounding waters where we find perhaps the most intriguing dive spot in the country: the Bubbling Reefs.

Methane

The bubbles, which seem to fizz out of some sandstone poles and archers that stick right out of the otherwise flat sandy bottom surrounding them, are methane that stems from ancient subterranean deposits of organic material being decomposed by microorganisms.

This is natural gas that is being produced and released through channels in the seabed. Denmark is the only place on earth where active bubbling reefs are found at shallow depths. In fact, the bubbling reefs around Hirsholmene can be found at depths of only 9 to 12m.

Sandstone structures

The striking structures, which come in the shape of both telegraph poles and intricate arches, are made of sandstone created by bacterial activity.

Microorganisms, which utilise the seeping methane as a source of energy, excrete compounds that fuse grains of sand into a solid structure, hard as concrete, which forms along the underground channels of seeping gas as it makes its way up through the seabed.

Once the sand shifts with changing currents, as they do over time, these solid structures get exposed and are left standing free and erect above the surrounding seabed. Soon they become covered with an assortment of kelp, sponges, anemones and other sessile life. In turn, this forms a habitat for fishes and crustaceans.


Unique Dive Site

The Bubbling Reefs

The Bubbling Reefs article was published in Issue#23. Click on the cover above to go to the article.

Getting there

The islets and reefs are close enough to the shore of Jutland for a RIB to be launched from the beach or one of the marinas. ■

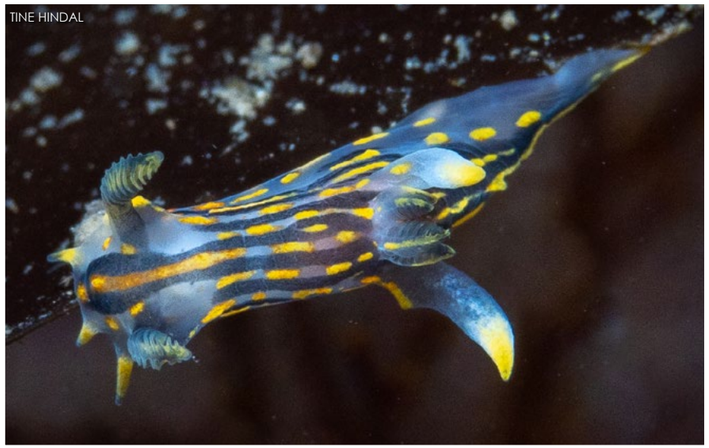
Marine Life in Danish Waters

— *A Selection of Images of Local Species*

Text by Peter Symes. Photos by Tine Hindal, David Holland, Lars Stenholt Kirkegaard, Morten Bjørn Larsen, René Bruno Nielsen, Mikkel Noe, Peter Symes

Onchidoris muricata nudibranch

Possibly *Eubranchus rupium*, the green balloon aeolid



Polycera quadrilineata is sometimes called the fourline nudibranch. The head has four, or occasionally six, yellow projections.

The greater weever (*Trachinus draco*) is an ambush predator that digs itself into fine sand during daytime, with only its eyes and the tip of the dorsal fin exposed (above).

This really nice closeup shot shows a nudibranch, *Onchidoris muricata*, feeding upon encrusting bryozoans, also known as moss animals, which cover large patches of the foliage of brown algae.

A nudibranch pushes its way past a couple of sea anemones. There are about 20 species of anemones in Danish waters. These two specimens are possibly small dahlia anemone (*Urticina felina*). The aolid nudibranch could be *Gulenia monicae* or *Gulenia orjani*, but there are several closely related species that, until quite recently, were considered one. The full story is posted **here**.

TINE HINDAL

Tubularia is a genus of hydroids that occur either solitary or in colonies, with a life cycle resembling that of typical Cnidaria: the phylum of stinging animals such as corals, jellyfish, box jellyfish and hydroids. However, unlike jellyfish, the medusae remain attached and never set free. In a way, they are inverted jellyfish on a stalk.

MIKKEL NOE

Measuring 4 to 5cm, the common goby (*Pomatoschistus microps*) breeds from February to September, at which time, the colour of the male darkens and his fins become more coloured. Eggs are laid under shells, stones or on aquatic plants. The male then guards the eggs until they hatch about nine days later.

LARS STENHOLT KIRKEGAARD

Lumpsuckers (*Cyclopterus lumpus*) have pelvic fins that form suction discs, which it uses to attach to rocks or other surfaces. Its colour is highly variable, from bluish, greyish, olive, yellowish to brownish hues, with the male turning a bright range of red during the breeding season. The male guards and cares for the eggs by fanning them with his fins during the month-long incubation period. The fish are coveted for their roe, which is featured in one of the local delicacies: lumpsucker caviar on toast, with finely chopped red onion and sour cream. The roe is a rich source of omega-3 fatty acids and vitamin B12. In the foreground is the tip of a frond of bladder wrack, which appears to be dotted with hydroids.

TINE HINDAL

Coryphella verrucosa rufibranchialis?

MIKKEL NOE

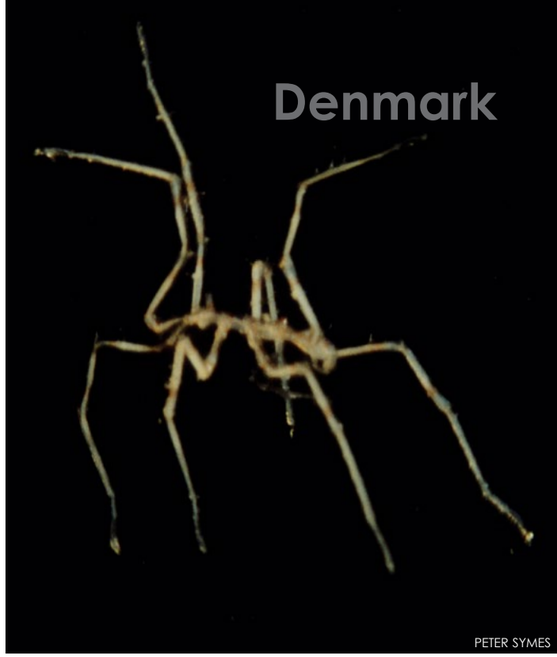
MIKKEL NOE

Aeolidia papillosa, or grey sea slug (above), has grey or brown pigments causing variable colouration from cream, fawn, grey, brown, orange, pink to dark purple-brown. The middle of the back lacks cerata down the center.

The snake pipefish (*Entelurus aequoreus*) is the largest species of pipefish recorded in European waters (right). They are generally found amongst marine grasses or algae close into shore where its colour and patterning provides good camouflage.

DAVID HOLLAND

Sea spiders (above) are not true spiders, or even arachnids, but marine arthropods of the order Pantopoda. They are found in oceans across the world but most commonly in shallow waters; *Limacia clavigera*, or orange-clubbed sea slug (left), is commonly found on the lower shore and in sublittoral algae belts.

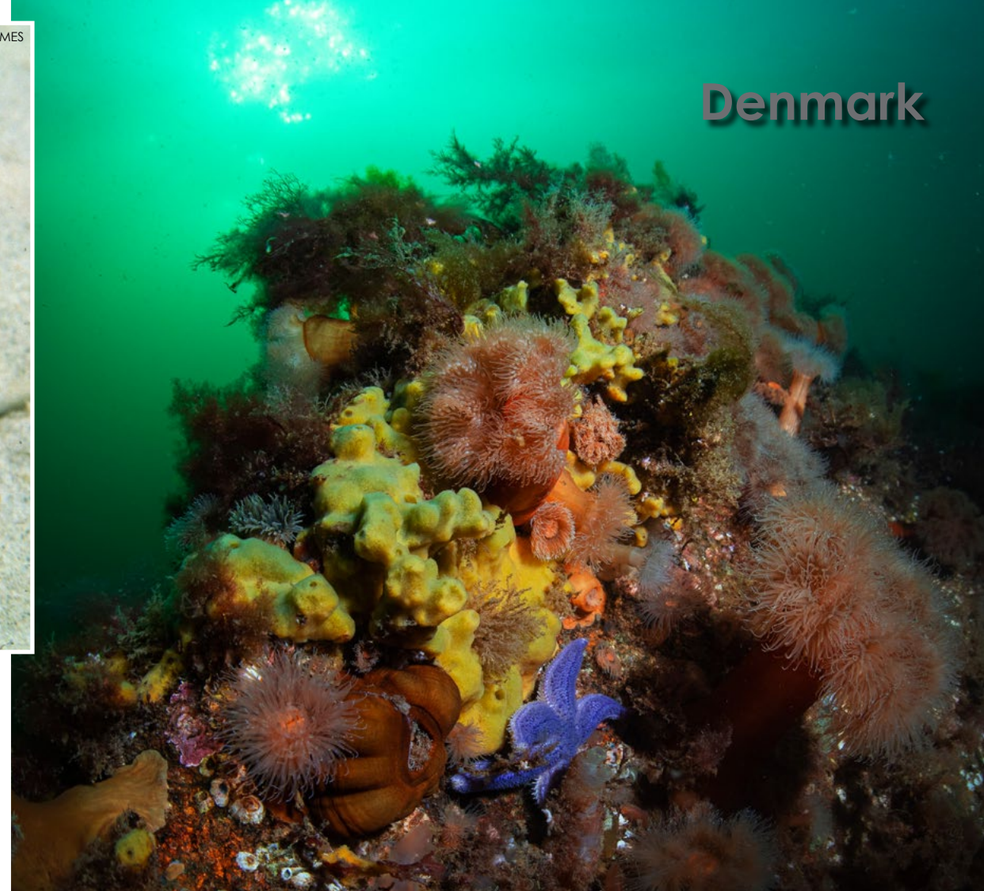


PETER SYMES

PETER SYMES

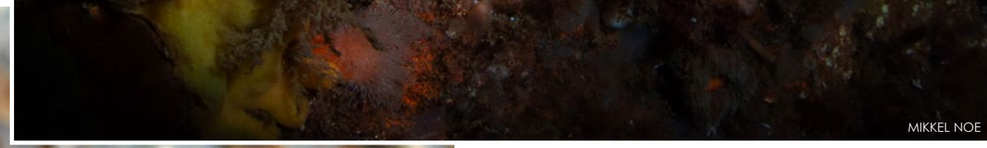

PETER SYMES


PETER SYMES


Denmark


RENÉ BRUNO NIELSEN

European plaice *Pleuronectes platessa* or European flounder *Platichthys flesus* (above). Both are commercially important flatfish. The two species are so closely related that they sometimes hybridise. Particularly in the western Baltic Sea, the hybrid is common; *Agonus cataphractus*, commonly known as the hooknose, pogge or armed bullhead (top left), is a species of fish in the family Agonidae, close to the scorpionfish and related to the sculpin; Body language can be universal. A lobster (left) lets the human know he is trespassing. European lobster or common lobster *Homarus gammarus* is the largest crustacean. It is protected and catches are highly regulated.


MIKKEL NOE

Atlantic cod (*Gadus morhua*) photographed from a rather unusual perspective (right). Cod is one of the most important commercial fishes, which has been fished for a thousand years, but many important stocks collapsed in the 1990s due to overfishing. Divers often see cod around wrecks where they like to seek shelter. For the same reasons, wrecks are also popular fishing spots for both professional fishers and anglers; snagged fishing gear and monofilament fishing lines caught on wrecks are often a concern for visiting divers.


MIKKEL NOE


RENÉ BRUNO NIELSEN

A colourful assortment of sessile life (above): In the centre, under the blue starfish, are yellow colonies of breadcrumb sponge *Halichondria panicea*—a suspension feeder feeding mainly on phytoplankton. On the right is a plumose anemone, *Metridium senile*, which is the largest anemone. The Danish name for it translates to "sea carnation." Assorted smaller anemones are interspersed with brown algae (kelp). Some white barnacles, which are also suspension feeders, can also be seen.

The shorthorn sculpin (left) spawns in December through March; the eggs are laid between rocks in a clump protected by the male. Its pectoral fins are webbed with sharp rays along the lower edge, a modification that helps with gripping the substrate in fast-flowing water.


DAVE HOLLAND


DAVE HOLLAND


DAVE HOLLAND


TINE HINDAL

Shorthorn sculpin, *Myoxocephalus scorpius* (above), is found among seaweed or on rocky bottoms with mud or sand. Like other coldwater fish, it has antifreeze proteins, which allow it to survive at temperatures around or slightly below freezing; Lion's mane jellyfish, *Cyanea capillata* (top right), uses its stinging tentacles to capture, pull in, and eat prey such as fish, zooplankton, sea creatures and smaller jellyfish.

Goby taking shelter in a shell (above); *Polycera quadriline-ata* on bryozoans (center right) Amphipod on marine grass (right)


PETER SYMES


RENÉ BRUNO NIELSEN


DAVE HOLLAND

The sea stickleback (*Spinachia spinachia*) is a solitary fish and a predator that lurks among conceal-ing vegetation (above); Bushy backed nudibranch, *Dendronotus frondosus* (right)

Dive Industry in Denmark

— *The Story of JJ-CCR*

Text and photos by Peter Symes

Some 80km south of Copenhagen, about one hour's drive, in what appears to be just some ordinary and inconspicuous farm buildings surrounded by fields out in the countryside, we find JJ-CCR—manufacturer of world-renowned closed circuit rebreathers.

I have known this company since its inception. JJ-CCR is founded and headed by Jan Petersen, whose expertise is in machining, but it was another Jan, surname Jørgensen, who certified me on the Inspiration Classic, a little over 20 years ago. Around that time, Jørgensen also happened to certify Petersen, and the two Jans—hence the name "JJ"—got into a fruitful discussion about designing and building a new rebreather, which led to the development of the first prototype in 2005. Jørgensen soon went on to pursue other business interests, but the two continued to dive together and confer on further developments.

By the end of 2006, Shearwater Research's GF computer was added as a controller, and back-mounted counterlungs were introduced in late 2007. At this point, Petersen decided to mature what was still a prototype and make it ready for market.

The workshop was rebuilt and tooling was purchased. Final refinements and testing took place during 2009. By the end of 2010, the JJ-CCR was ready and CE certified. CE certification affirms that a product has been assessed to meet high safety, health, and environmental protection requirements, in compliance with relevant EU legislation.

The "JJ," as the unit is fondly referred to by its enthusiastic user group, is not a rebreather intended for entry-level recreational divers—although Petersen contends it can also be used by recreational divers. It is more of a purist concept, doing away with some of the complications and added features such as an integrated bailout mouthpiece, which has become one of the requirements for closed circuit rebreathers to be designated recreational (so-called Type R), or permitted for entry-level dive training.

As such, a JJ is an advanced piece of kit made for advanced and technical divers who can appreciate its less complex, more rugged, and therefore, in theory, more fail-safe design. Or, as the byline on the company website states: "The JJ-CCR is a rugged and versatile rebreather developed for harsh wreck and cave environments." It was never intended for the sports diving market but engineered to be a solid tool for professional wreck divers who worked in the deep, dark and cold waters of the Baltic Sea.

One of our regular technical diving contributors and columnists, who also happens to be a JJ-CCR instructor, explained that the oft-used description of the JJ as being "the 4 x 4 of the rebreather community" is fitting. The characteristics he foremost highlighted is its versatility and adaptability to a multitude of applications, a variety of environments and different users. It is also capable of being operated completely manually, and on off-board gas if desired. ■

Præstø

PHOTO COURTESY OF JJ-CCR

The JJ-CCR

Jan Petersen assembles rebreathers, by a window with a view of the surrounding farmland (above).

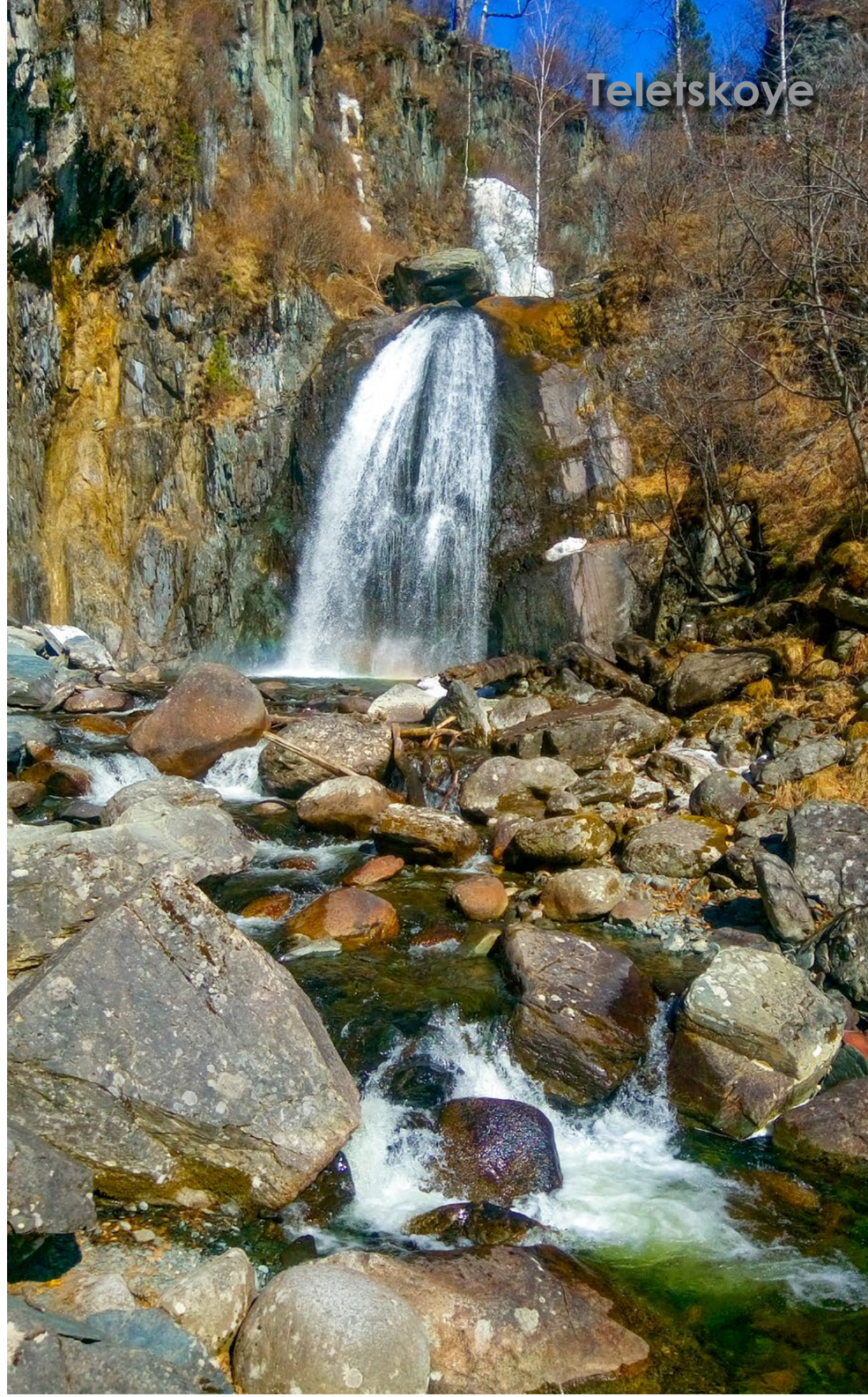
Jan Petersen takes Andrea Donati, principal of Ponza Diving in Italy and a long-term customer, out for a spin in his high-powered RIB (right).

Factory warehouse of JJ-CCR, located 80km south of Copenhagen (above); Assembly of components of the JJ-CCR (right)

Russia's Lake Teletskoye

— *Diving in the Altai Nature Reserve*

Text and photos by Roman Vorobyev and Tatyana Klimenko



Beautiful scenery and pristine nature in the Altai Nature Reserve. PREVIOUS PAGE: Steep mountains and wilderness surround Lake Teletskoye.

Somewhere, far from civilisation, there is a secret place, lost among the high mountains and impassable wild forests. Here, where, for a hundred kilometres, you will not meet another person, there are roaring streams of waterfalls breaking from steep coasts, and in winter, instead of ice-bound lakes and rivers, waves rage. At the same time, in this place, the mysterious dark depths of one of the deepest and largest lakes in Russia attracts hundreds of divers every year. Intrigued? Then we invite you on an adventure to Lake Teletskoye.

In the Altai Mountains, one finds snow-capped peaks, rushing rivers and blue lakes in a green sea of forests and tundra. Few places on earth can compare to its majestic beauty. To preserve the pristine nature of Altai, the Altai Nature Reserve was created in 1932. It is the only specially protected natural area in Russia where diving has been actively developed and supported, as a type of ecotourism, which will not harm the nature found here. With a length of 77km and a depth of 325m, Lake Teletskoye is the largest body of water and reservoir in Altai. It is filled with the legends and myths of the local indigenous people.

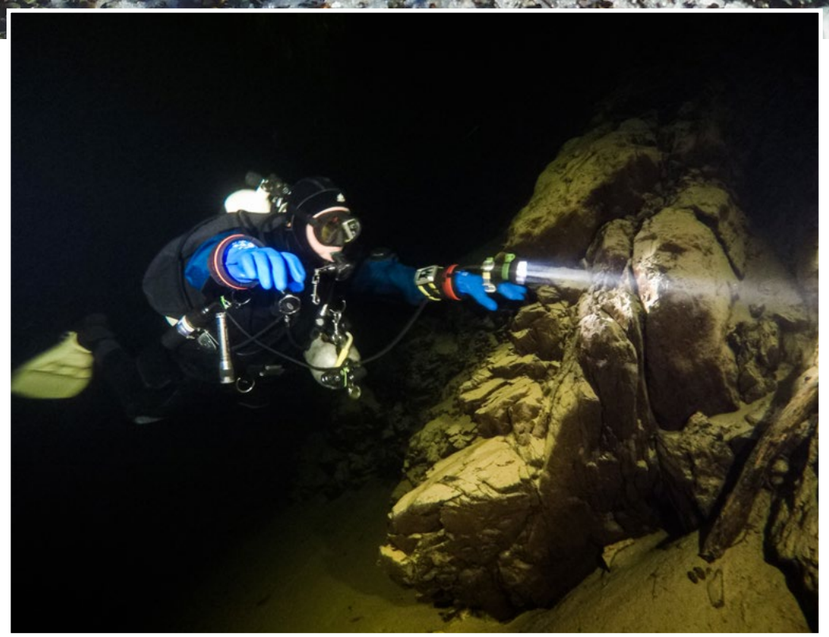
Getting there

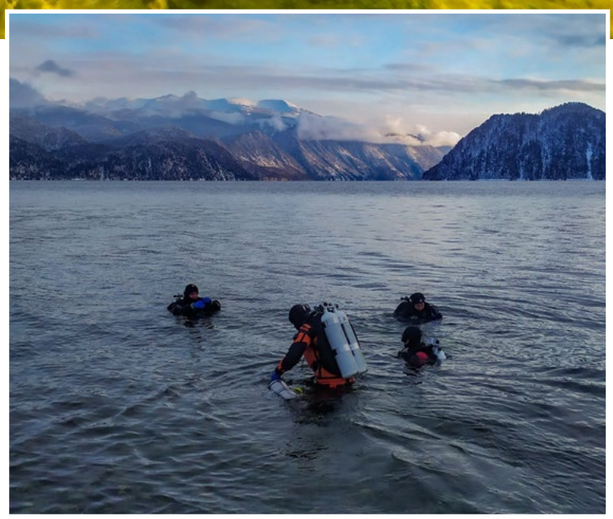
The road to Altai begins with a flight to Gorno-Altaisk, the capital of the Altai Republic. Then there is a transfer of 200km, in which travellers ride along the mountain ranges and through mountain passes in a rugged vehicle for about four hours. The journey on the road to the lake itself is a pleasant adventure, where you can enjoy scenic views and rich aromas of the taiga, or boreal forest.

At the bottom of the last winding and picturesque descent of the mountainous trail, with an elevation change of one kilometre from the summit to the base, visitors register at a checkpoint entrance (remember, this is a specially protected natural area) and check in to the cosiest spot for divers in Siberia: the village of Yaylu, which is the small original settlement in the area.

Yaylu is also the central estate of the Altai Reserve and is technologically quite developed, with round-the-clock power supply from a diesel-solar power plant, high-speed

There are many waterfalls in the area that increase their flow into Lake Teletskoye in spring.





Many dives in Lake Teletskoye are deep at 15 to 20m and considered night dives, no matter what time of day (above); The sound of waves all winter long attracts many visitors (top left); On the bottom are boulders the size of cars (top right); The lake can be dived all year round (right).

internet access points and 4G internet connection. In Yaylu, there are no large tourist complexes and no huge numbers of tourists—it's just a quiet place in the middle of the forest. Divers are accommodated in the comfortable guest houses of local residents. The nature reserve authorities impose certain restrictions: Hunting (including underwater), fishing, bonfires, setting up tents and simply being on the reserve's territory without permission are prohibited. But this is a small price to pay for preserving Altai's wilderness for future generations.

About the lake

And now, let's go to the shore of the main attraction: Lake Teletskoye, also known as Golden Lake. Geologically, Lake Teletskoye is located on a tectonic fault, and its modern shape was formed about 20,000 years ago during the last epoch of glaciation.

One of the most interesting features of the lake is that one can dive in open water here all year round. Teletskoye is one of the few non-freezing freshwater lakes in Russia, completely freezing over only once every six to eight years. However, there can be really severe storms here, with wave heights of up to two metres. Yet, the sound of the surf all winter long is what people come here to enjoy.

The coasts of the Teletskoye are mostly high and steep. There are no roads along the coast, and dive sites are accessible mainly from the water.

Diving

So, how does Lake Teletskoye surprise an experienced diver? Let's start with the fact that on Teletskoye, every dive is deeper than 15 to 20m and considered a night dive, regardless of the time of day. When diving, one will experience a sensation of falling into an almost palpable blackness, as if you are descending into a thick layer of black ink, where the beams of dive lamps or torches shorten and fade. The only thing that reminds one that the sun still exists is the dim green ceiling when one looks up. At 30m, it also disappears. The visitor enters the realm of eternal darkness.

At depths of more than 40m, darkness always combines with the crystal clarity of the water. Technical diving on Lake Teletskoye is remarkable because—regardless of the season or the weather—at depths below 40m, visibility is limited only by the power of your dive lamp. Silt from the surface does not reach this depth,

Visibility is clear at depth, and underwater landscapes vary from silt-laden plateaus to steep rocky walls.

and the transparency of the water is always good. At the same time, the sensation of diving here can best be described as flying in outer space.

The water temperature in Lake Teletskoye most often varies in a narrow range from 1 to 4°C. In summer, only the first few metres warm up, so drysuits are mandatory. You can dive in the lake all year round. If one does not have experience diving in a drysuit, this is not a problem, as there is a wide range of sizes in drysuits for rent, and a drysuit course can be completed in two days.

Underwater, Lake Teletskoye is a vast sandy, muddy desert, with the play of the sun's rays in the lake's shallows, and steep piles of rocks, vertical walls, and a secret night life for fishes in its seemingly unlimited depths with absolutely transparent water clarity.

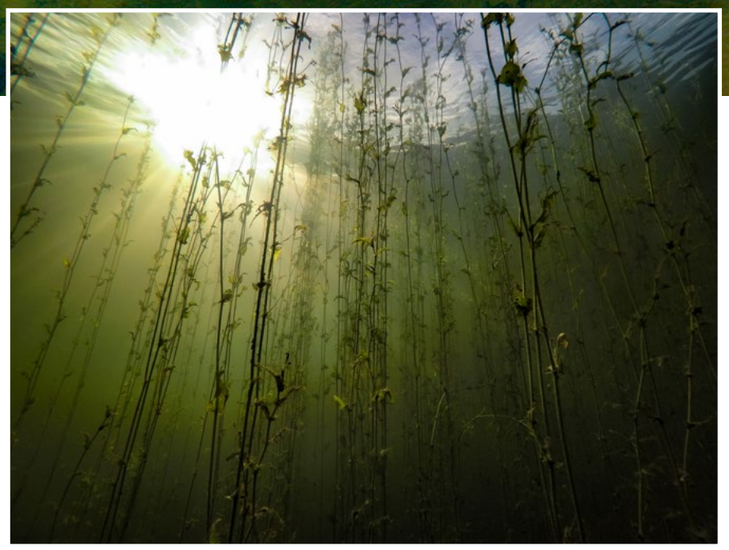
The underwater landscape along the lake's shallow coastal strip is usually a plateau with rocks and driftwood overgrown with algae. One can sometimes find really huge trees on the lake bottom. Boulders here are often the size of cars. Then, the mud-and-sand lakebed slopes downward. Deeper down lie massive rocks. On clear, sunny days with good visibility, the landscape sometimes reminds one of endless dunes in the deserts.

At the dive site in Yaylu, divers do a mandatory check-dive. For those who are here for the first time, it is necessary to understand the specific conditions and get used to the features of the reservoir. Here, the shallow water is flooded with sunlight on a clear day. Diving lower, divers will find a fairly steep muddy slope and pass by the remains of a sunken pier built in the early '60s from thick pine logs. Now, it serves as a home and shelter for many underwater organisms.

The Yaylu area of the lake is suitable for really deep dives; the slope is quite steep, with vertical stone walls alternating with stepped silted terraces. From 50 to 55m, the muddy slope breaks down to a steep wall and a terrace or cliff at 80m. Below this point, at 100m, there is again a wall, at the foot of which one reaches a gentle plateau. All the horizontal surfaces in the lake are covered with sediment, like fallen snow. In some plac-

Sometimes huge trees can be found on the lake bottom.

Aerial view of Lake Teletskoye, showing the mixing of sediments, pollen, vegetation and other matter deposited into the lake by rivers and streams



Underwater vegetation reaches up to the surface to catch the light.

es, there are traces of the activity of the stream, which carries out into the lake what once grew, bloomed, crawled or flew around it—creating a "layer cake" of dark swathes of leaves, twigs, blades of grass and insects, on top of the sediments on the lakebed.

This is just one dive site, and the variety of underwater landscapes in the lake is impressive: sheer walls of marble and limestone, with remains of wrecks, black underwater rocks, shallow shelves, vertical walls, and in some places, rugged canyons. Sometimes, you will see structures that resemble the superstructures of sunken ships or the spires of Gothic cathedrals.

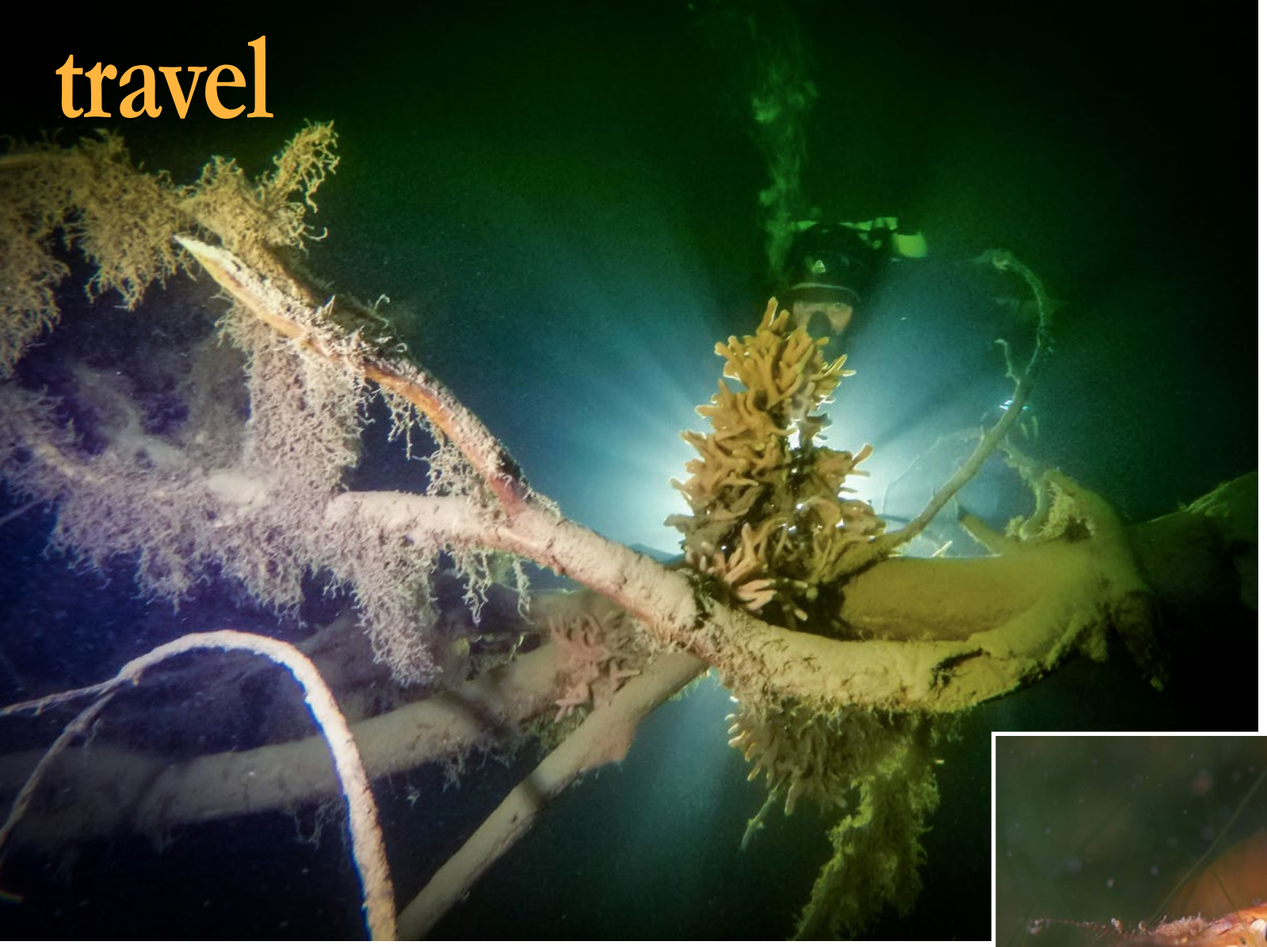
Seasons

When can you come? The answer is simple: any time. Each time of year has its own characteristics and charms.

Spring. The most pleasant thing for divers in spring is the perfect transparency of the water. In springtime, large waves no longer raise silt near the coastal strip, cold water (2°C) does not allow plankton to actively vegetate, and the rivers flowing into the lake have not yet collected and carried a large enough flow of muddy water to impair visibility at a considerable distance. On sunny days, you can see underwater landscapes for tens of metres into the distance.

In May, the shores of Lake Teletskoye are painted with purple flowers of Ledebur rhododendron; this is the hallmark of the Altai spring. On the lawns, spring flowers successively replace one another—white, purple, yellow and orange.

In the spring, you can also observe fog on the lake as rolling "waves" on the shore, covering not only the mountains on the other side, but also the next few metres, with a dense veil of cloud. The level of the lake at this time rises very quickly, with the water rising by 30cm per day. The lake swallows up four to five metres



Diatom algae colonies depend on sunlight and cover shallow waters in spring (above); Sponges grow on driftwood (top left); Snail (right); The ephemeral mayfly larva (left) lives underwater for two to three years. Upon adulthood, it lives only a few hours and dies immediately after reproduction.

Juvenile pike

of shoreline every day, which makes it easier to carry dive equipment to the water. Under the water, there is still an almost wintery coolness in temperature as well as good transparency. Usually, good visibility is maintained until the end of June.

Summer. In summer, a stream of water, muddy with clay, flows through the lake from the Chulyshman River, the main inflow of Lake Teletskoye. From the tops of the mountain slopes, you can see how the river and lake waters mix, forming patterns resembling the pattern of milk foam in a cappuccino. You can observe large accumulations of coniferous pollen on the water; they merge into giant "rivers" that stretch for kilometres. Visibility in the surface layers at this time rarely exceeds two to three metres and improves within a month. In this way, ultrapure mountain water is enriched with minerals and organic matter to continue the cycle of life. Nevertheless, the lake is large, and there are always places where the water remains clear.

Autumn. In the autumn (September to October), you will be greeted by the serenity of early fall. The surface layers of the lake are still warmed up to 9 to 16°C—a pleasant temperature for macro photography and decompression stops. The calm waters hide the life bubbling under the mirror surface of the lake.

Schools of grayling and young pike can always be seen on a night dive, but the most interesting thing to observe takes place in the world of invertebrates. The growth period of freshwater sponges is still ongoing in the fall. Their bright pink colonies grow into bizarre forms, from "bushes"

Divers explore the rocky terrain under the ice, which forms dramatic shapes overhead (above and top right); Diver jumps into a hole carved into the ice (right).

to "fingers" and tree-like shapes. Another feature of early autumn are the underwater carpets of hydra, covering everything everywhere. Dense clusters and tangles of tentacles are found on rocks, wood, metal, and even on other invertebrates. Hydra passengers ride on snails. All of this and much more can be seen by an attentive observer.

Winter. In winter, the lake is dominated by the winds; they bring high waves onto the shore. For lovers of contemplation, Yaylu provides not only the luxury of the sound of the surf and the view of the emerald waves, but also an extensive park of bizarre ice sculptures that are formed by the constant freezing of cold-water spray, falling on rocks and trees. No ice figure park can surpass the creations of nature.

What happens underwater in a storm can be briefly described as a "washing machine," very noisy and sometimes working around the clock. During storms, raised silt and sand from coastal areas do not allow one to see anything beyond one's outstretched arm, in the first three metres of a dive. Water fluctuations are felt up to the six-metre mark. At the same depth, the transparency of the water becomes better and better, and at 30m, the diver is met with silence, in the calm and eternal darkness.

At this time of year, the mood of the Golden Lake changes not only from day to day, but also during the course of one day. By the evening, the wind subsides, and it becomes quite a feasible mission to go into the water. The silt quickly settles and visibility in shallow water is restored again.

Ice cover is usually not able to establish itself because of strong winter winds, but sometimes—usually in February, due to the severe cold and rare hours of calm—Lake Teletskoye, although reluctantly, gives in to winter and freezes. A few days after freezing, the transparency of the water can reach 40m, and at a short distance, the water seems almost invisible. The preparation of ice holes is not hard work; the ice is rarely thicker than 30cm and does not cover the lake for more than two months—a great chance to learn ice diving!

Features of local fauna

Undoubtedly, the biodiversity of the lake is typical of cold seas and a minimal food supply due to cold water that is harder to warm, but an attentive observer will always see what is hidden at first glance. The best time to observe

the lake's fauna is at night. Burbot rise from the depths of the lake, grayling can be seen in the shallow waters, and pike (as befits a dominant species of an ecosystem) calmly, and with dignity, patrol their territory, looking with interest at the strange visitors with fins and tanks.

At night, the water near the lake bottom is a "soup" of oar-footed crustaceans and small fishes. Vertical rock surfaces without silt are covered with a carpet of hydra. And on the muddy lakebed, life just boils, even under the ice: Small stonefish jump from place to place; gammarus swarm; leeches wriggle, trying to suck on a new host; cyclops crustaceans quickly hide from the light of dive torches; and hydra slowly hunt them, spreading their long tentacles. All these critters are small and fussy—a real challenge for the macro photographer.

Broken ice covers the surface of Lake Teletskoye in winter (top right); Pike shelters in submerged wooden structure (top left); Tentacles of hydra dangle from an overhang (far left); Juvenile burbot (center); Perch fish (above)

Teletskoye

Siberian sculpin (above) and burbot (top right) resting on the lake bottom at night; Cyclops copepod with eggs (left)

Dive centre

The underwater research station of the Altai Nature Reserve is located on the shore of Lake Teletskoye in the village of Yaylyu. Despite the distance from civilisation, the centre has everything divers need for recreational and technical diving: a tank-filling station, compressors, equipment for preparing gases (oxygen, nitrox, trimix). There are dry and wet areas where you can change clothes and dry your equipment, as well as hot tea (made from local herbs) to drink after winter dives, by the warmth and crackle of a wood-burning stove.

There is also a comfortable classroom where training is conducted, from the beginning level (CMAS, SDI) to the technical (TDI), and all underwater guests are given information about the world of the unique Altai lake. The centre stays open all year round, as its friendly team is constantly in the water.

But the centre's work is not just about tourism. Regular work is carried out to clean up Lake Teletskoye of illegal and abandoned nets, and garbage. Comprehensive studies of plankton, as the basis of the aquatic ecosystem, and environmental monitoring are carried out. Research has begun in the field of underwater dendrochronology—submerged wood is of particular interest, as it is a promising repository of information about climate change and past events, and it opens up wide opportunities for dating artefacts. Diving for us is not just work. This is a way of knowing ourselves and the parallel universe on the other side of the water's surface. ■

The staff of the underwater research station at Lake Teletskoye includes Tatyana Klimenko, instructor of TDI, SDI, CMAS; and Roman Vorobyov, researcher of the Altai Nature Reserve, certified gas-blender, divemaster, trimix diver and doctor. For more information, email: ***zazerkalie04@yandex.ru****, or go to:* ***youtube.com/channel/UCHoMTcD2MnBnUfCloSlLrvQ*** *and* ***facebook.com/AltayskiyZapovednik***

Authors Tatyana Klimenko and Roman Vorobyev

My Most Unusual & Unexpected Dive

Contributors' Picks from Around the World

Text and photos by Scott Bennett, Larry Cohen, Lureen Ferretti, Frankie Grant, Jennifer Idol, Kate Jonker, Matthew Meier, Brandi Mueller, Gary Rose, Don Silcock, Olga Torrey, Martin Voeller and Beth Watson

We asked our contributors what their most unusual or unexpected dive was and they sent us photos and tales of unique experiences under the waves, some involving interactions with intriguing species, others purely chance encounters or surprising discoveries. From the tropical waters of Indonesia, the Philippines, Marshall Islands, Mexico's Revillagigedo Islands, Kona in Hawaii and Cuba, to the subtropical waters off the eastern coast of Florida in the United States and Mexico's Los Islotes, to the temperate waters of South Africa, Japan and the Puget Sound in America's Pacific Northwest, to a freshwater lake in China, *X-Ray Mag* contributors share their favorite uncommon underwater moments.

MARTIN VOELLER

Mola mola is a species that often gets caught inside the fishermen's nets, Chiba, Japan. Exposure: ISO 280, f/19, 1/180s. Gear: Nikon D4S camera, Sigma 15mm lens, Subal ND4 housing with Zen-DP 230 fisheye dome port, two Inon Z-240 strobes

PREVIOUS PAGE: Mola mola and a diver, Chiba, Japan. Exposure: ISO 400, f/13, 1/350s. Gear: Nikon D4S camera, Sigma 15mm lens, Subal ND4 housing with Zen-DP 230 fisheye dome port, two Inon Z-240 strobes

Topside view of a whale shark in blue water, Chiba, Japan (right). Exposure: ISO 560, f/9.5, 1/350s. Gear: Nikon D4S camera, Sigma 15mm lens, Subal ND4 housing with Zen-DP 230 fisheye dome port, ambient light

Net Traps, Chiba, Japan

Text and photos
by Martin Voeller

Japan is a country known for its fishing industry, and it should be no surprise that the Japanese coasts are controlled by the country's fishers. There are pockets of areas along the coast where the fishers will have their stationary net traps set up in shallow waters—called *teichi-ami* in Japanese—and many fish that get caught in these nets are then sold off to the fish markets.

Mackerel, sardines and herring are some of the most common fish found in these nets, but oftentimes, larger fish that prey on these fish can end up in these nets as well—these can include sharks and sometimes even whales. A dive shop located in Chiba, Japan, will often rescue these larger fish, but they cannot simply be released back to the ocean, as they are most likely weak and injured from getting caught inside the net.

The dive shop has created a colossal, rectangular net-enclosure, which has been placed in the open ocean, and this is where some of these larger, frequent visitors (including mola molas and whale sharks) are temporarily housed and fed. This allows the fish to heal from their injuries and, in the interim, divers can dive inside this enclosure before the fish are released back into the wild.

This dive, to me, is special—it gives me close encounters with these rare species of fish, with the knowledge that they will soon be released back into the wild after their recovery. Please visit: **poseidonphotos.com**

Broadnose sevengill cow shark (left). Exposure: ISO 160, 20mm, f/7.1, 1/80s. Gear: Nikon D200 camera, 10-20mm lens, Hugyfot housing, two Ikelite DS-125 strobes; Puffadder shyshark (above). Exposure: ISO 320, 16mm, f/10, 1/160s; Red roman (right). Exposure: ISO 320, 19mm, f/8, 1/160s. Gear used for images above and right: Nikon D810 camera, 16-35mm lens, Seacam housing, two Ikelite DS-160 strobes

Pyjama shark, Miller's Point, South Africa. Exposure: ISO 320, 16mm, f/9, 1/60s. Gear: Nikon D810 camera, 16-35mm lens, Seacam housing, two Ikelite DS-160 strobes

Miller's Point, Cape Town, South Africa

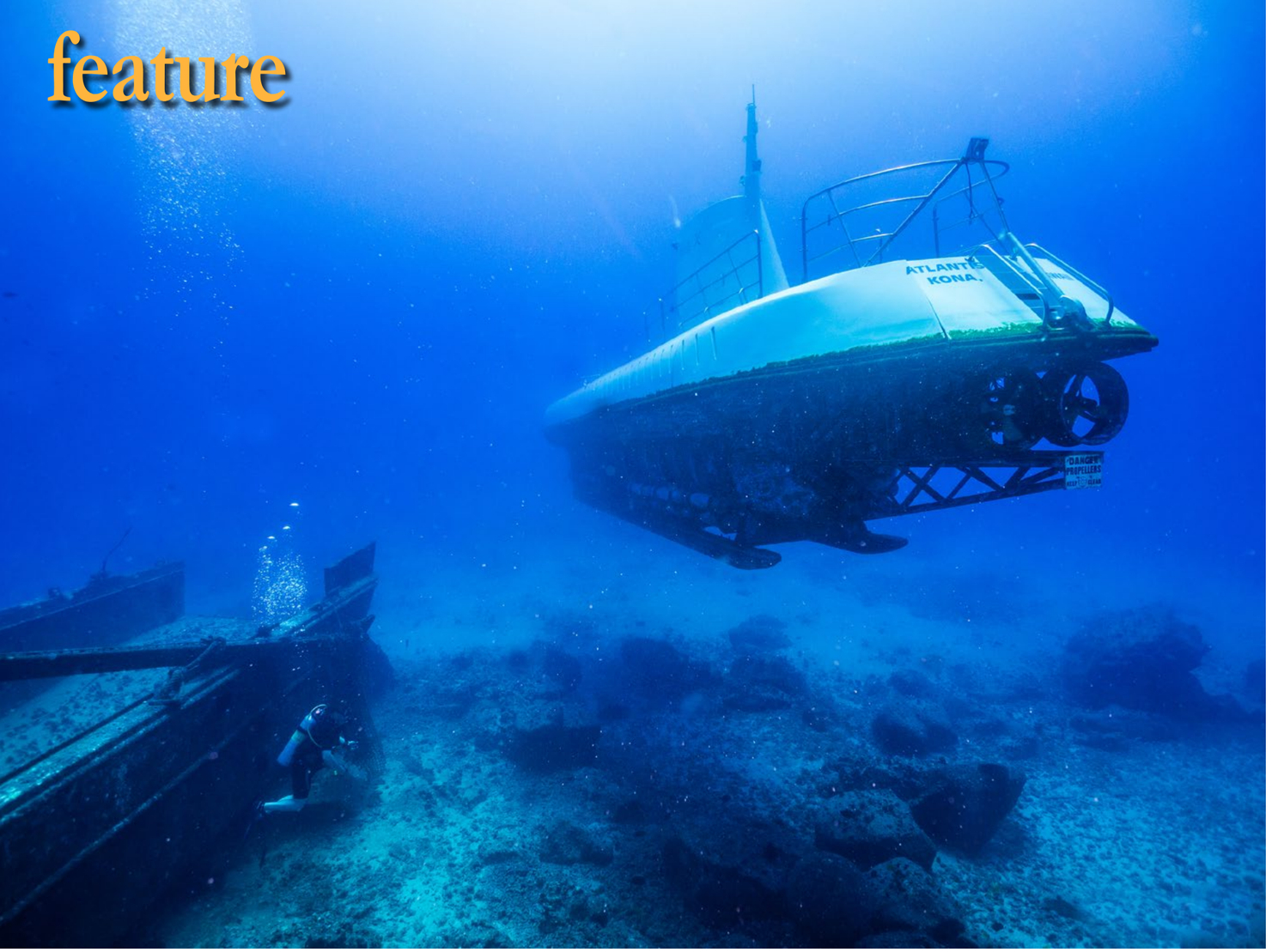
Text and photos by Scott Bennett

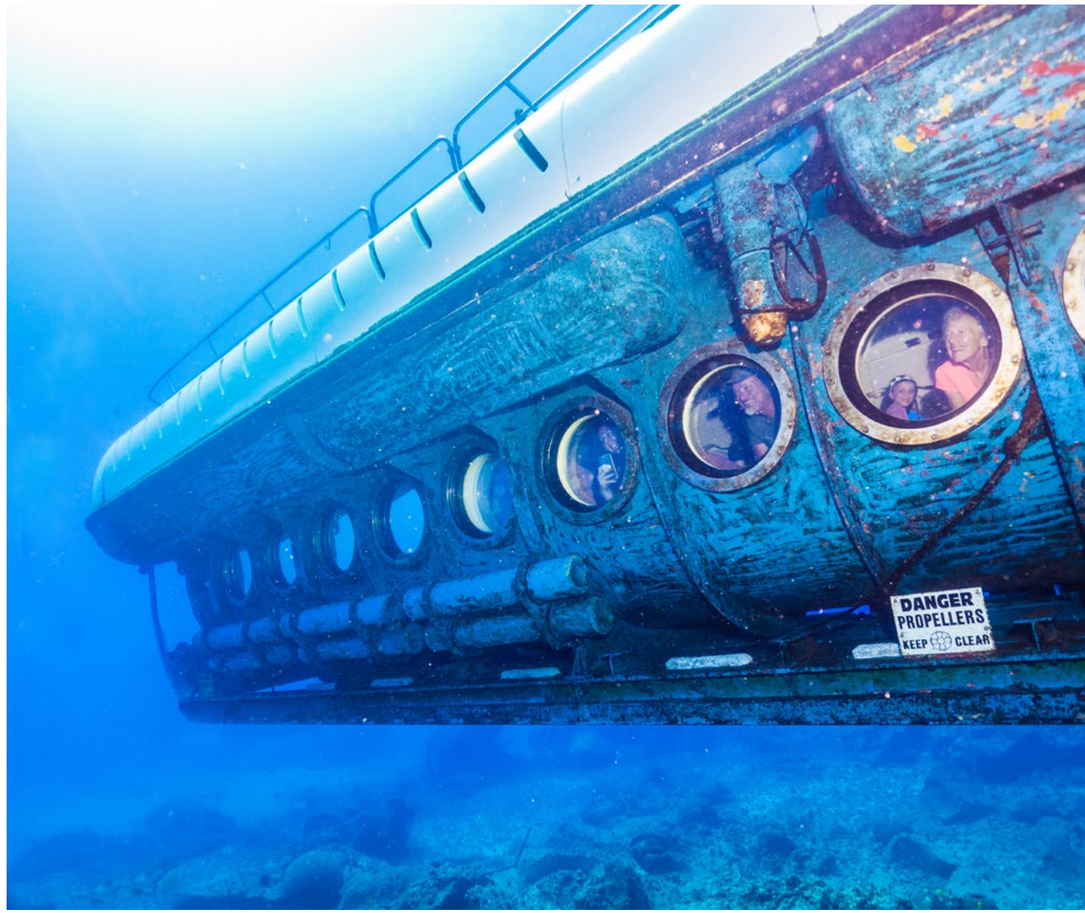
Situated in False Bay, south of Cape Town, Miller's Point was my first-ever dive in a kelp forest. As a long-time tropical diver, it was an environment unlike anything I had encountered before. From the seabed at 12m, stands of kelp soared to the surface as urchins, anemones and starfish shrouded the seabed below. Light filtering from above created an ethereal feel, it was like being in an undersea cathedral. I was awestruck!

A highlight was the appearance of broadnose sevengill cow sharks, usually a deep-water species, but commonly observed here. Patrolling the channels between the kelp, they are an ancient species measuring up to 3m in length. They are also inquisitive, closely approaching divers before veering off at the last second. One came so close, I had to gently nudge it away with my strobe!

On a second visit a few years later, the cow sharks had been scared off by visiting orca, but there was no shortage of fish action. As soon as our dive guide Ernest opened his bag of fishy treats, we were literally engulfed by a fish frenzy. Vivid red romans were especially bold, joined by other species, including hottentots and red steenbras. Octopus can also be seen, but their immaculate camouflage requires closer scrutiny of the seabed.

There were also plenty of smaller sharks. Small, but brimming with attitude, the aptly named pyjama sharks zoomed past, looking for morsels, while leopard catsharks and puffadder shysharks were much more placid. The surrounding area was familiar to many of my fellow divers, having been featured in popular documentaries such as *Blue Planet II* and *My Octopus Teacher*. Visit: **xray-mag.com/Contributors/Scott-Bennett**





Atlantis tourist submarine, hovering next to the wreck of the *Predator*, explores the waters around Kona.

Tourists enjoy seeing the divers (above); Dive buddy, Olga Torrey, photographs the submarine (top right)

Tourist Submarine, Kona, Hawaii

Text and photos by Larry Cohen

I had one of my most unusual dives when in Kona, Hawaii, while exploring the wreck of the *Predator* with Jack's Diving Locker. I was photographing my dive buddy, Olga Torrey, when I discovered one of my fiber optic cables was not working. I decided to keep shooting. I had to reposition my strobe, and I concentrated on the details of the wreck and small marine life, so I could light the subjects with one strobe.

As I was shooting, we heard a rumble in the distance. The thunder got louder and louder, then we spotted a strange shadow in the distance. As it got closer, we were surprised by a submarine! The Atlantis tourist submarine also wanted to explore this shipwreck. Through the portholes, we spotted the smiling faces of children and their parents. They were very excited to see a group of scuba divers swimming around the wreck. Of course, I was excited to document a submarine cruising around the wreck and the tourists' excitement inside the sub.

I thought this was an excellent opportunity, but I only had one working strobe! So, I mainly used ambient light to photograph the large submarine and used my one strobe to fill in the shadows. The strobe still helped bring out the details to show the inhabitants of the sub.

I used an Olympus OM-D E-M1 in an Aquatica housing with the Olympus 9-18mm lens to capture the images. One Sea&Sea YS-D1 strobe was used for lighting. The ISO was set at 200, and the aperture at f/11. The shutter speed varied from 1/100 to 1/320. Please visit: **liquidimagesuw.com**

Manta ray (above); Whale shark enjoying divers' exhaust bubbles (left); Komodo dragons (right)

Ornate ghost pipefish, Komodo

Komodo, Indonesia

Text and photos by Lureen Ferretti

Selecting the most extraordinary dive is impossible. Every dive I have had brings back fond memories and has offered something unique and special—from sharks, mantas and brilliant, colorful, healthy soft corals to pygmy seahorses and ornate ghost pipefish, the experiences have been endless.

This task brought back so many fantastic memories, causing me to change my mind several times before finally deciding on Komodo, Indonesia. It won out due to the abundance and variety of both marine and terrestrial life.

The checkout dive was conducted in a relatively shallow site with little to no current but LOADED with critters. The first subject our dive guide pointed out was a thorny seahorse, then a stone's throw away was not one, not two, but three ornate ghost pipefish! Of all species on this trip, I saw more pipefish than on all prior dive trips combined. However, it was not all about the little critters—there were plenty of mantas and whale sharks as well. For the first time, I saw the playful side of a whale shark. If I had been unfamiliar with whale sharks, this individual's odd behavior would have frightened me: Whenever a diver exhaled, the whale shark swam directly towards that diver to suck in the bubbles. It was the funniest thing to watch.

The reefs of Komodo were spectacular, and the water clarity was so clear. We saw rays for days. The surface views were just as breathtaking. Every morning, I joined other guests for morning tea as we watched the sun rise.

No trip to Komodo would be complete without seeing the Komodo dragons. I went to Rinca to see them, but they inhabit four other nearby islands as well. Although they generally spend their time sleeping, I managed to catch two of them in a wrestling match while the others lay around completely uninterested.

The last dive in Komodo left me yearning to return. We hit the reef in the late afternoon; there were thousands of fish, of many shapes, sizes and species. The tuna and jacks were hunting, and every time they dived towards their prey, the entire school of fish would change direction. It was the first time I heard the sound of schools of fish changing directions abruptly, and in such a large mass that it was audible. That dive is forever imprinted in my memory. Visit: **DeepWaterPics.com**

Playful sea lion pup at Los Islotes, Baja California Sur, Mexico. Exposure: ISO 160, f/10, 1/160s. Camera gear used for both images: Canon 7d Mark II camera, Tokina 10-17mm fisheye lens, Sea&Sea housing with dual YS-D2 strobes

Sea Lions, Los Islotes, Baja California Sur, Mexico

Text and photos by Frankie Grant

During the fall, about an hour's boat ride from La Paz, Mexico, newborn sea lions finally begin venturing into the warm waters surrounding Los Islotes. The character and behavior of these sea lion pups makes for one of the most spectacular pinniped interactions in all of North America.

On this particular day, it was not necessarily that the sea lion pups were being playful, as this is quite common, but more so the type of interaction and level of engagement of the animals. I enjoyed their presence for over an hour, tucked within a shallow slot in the island with the two pups. They are known to chase bait and carry rocks and sea stars in their mouths, but on this unexpected occasion, one was a bit more boisterous. The pup began trying as best it could to chew on and remove my snorkel and even my mask. The two of them worked together to distract me with acrobatics, while the other would go for the snorkel. What a treat! Visit: **frankiegrant.com**.

Sea lion pup tries to steal my snorkel! Exposure: ISO 160, f/8, 1/125s

Giant plumose anemones near Alki Beach open to catch food (above). Exposure: ISO 400, 10mm, f/18, 1/50s. Gear: Nikon D90 camera, Nikkor 10-24mm lens, Nauticam housing; Polyps extend from sea whips to collect food in Hood Canal (left). Exposure: ISO 800, 16mm, f/8.0, 1/125s. Gear: Nikon D5 camera, Nikkor 16-35mm lens, Nauticam housing

Kelp rockfish meander in the darkness at depth in Hood Canal (above). Exposure: ISO 800, 35mm, f/8, 1/125s. Gear: Nikon D5 camera, Nikkor 16-35mm lens, Nauticam housing; Lewis' moonsnail carries its house underneath while on the move, as seen here at Alki Beach (center). Exposure: ISO 400, 24mm, f/8.0, 1/60s. Gear: Nikon D90 camera, Nikkor 10-24mm lens, Nauticam housing; I came across a resting lingcod in the darkness in Hood Canal (top right). Exposure: ISO 800, 35mm, f/8.0, 1/125s. Nikon D5 camera, Nikkor 16-35mm lens, Nauticam housing

Puget Sound, Washington, USA

Text and photos by Jennifer Idol

Nothing is quite as exhilarating as the feeling of discovery. On my first trip through the Puget Sound, I was heading to Hawaii, an expected destination, but decided to pause for some dives in Seattle. This proved most rewarding, as I discovered for myself the Pacific Northwest and the unusual life in its waters. From wolf eels to giant plumose anemones, I was smitten by the variety of substantive subjects.

This surprise spurred future trips to learn more about this unique habitat. Although cold water is challenging, it has proved the most rewarding for me in terms of subjects. Life is unexpectedly rich in cold waters and of a larger size than expected.

Giant Pacific octopus and wolf eels make the region famous, but even stranger life, such as the tall sea whips and Lewis' moonsnail, keep alive the search for more life. From kelp rockfish to lingcod, the fish life is also abundant. Puget Sound is easy to shore-dive in its many inlets and is protected from the turbulence of the open sea. For the macro-oriented, large nudibranchs can also be found in the region.

Alki Beach is probably the best known and easiest shore entry I experienced. Puget Sound also connects directly to other areas such as Hood Canal and includes the cities of Seattle, Tacoma, Olympia and Everett.

Although I aim to be prepared for all surprises through research and experience before diving a location, some of the greatest joy can come from a positive revelation. Please visit: **uwDesigner.com**

Fiery nudibranch (*Okenia amoenula*) feasting on bryozoans (*Laminopora jellyae*), of which there are so many on this reef. Exposure: ISO 160, f/22, 1/250s. Gear: Nikon D850 camera, Nikonos 105mm macro lens, Isotta housing, two Sea&Sea YS-D1 strobes

White choirboys ascidians (*Podoclavella sp.*) carpet the reef (top left). Exposure: ISO 200, f/14, 1/200s. Gear: Sony A6400 camera, Zeiss Touit 50mm macro lens, Fantasea FA6400 housing, two Sea&Sea YS-D1 strobes; Tiny basket star clinging to yellow and pink multicoloured sea fan (top right). Exposure: ISO 100, f/5.6, 1/250s. Gear: Sony A6400 camera, Zeiss Touit 50mm macro lens, Fantasea FA6400 housing, two Sea&Sea YS-D1 strobes; Candy nudibranch (*Cuthona speciosa*) feasting on a multicoloured sea fan (right). Exposure: ISO 160, f/18, 1/250s. Gear: Nikon D850 camera, Nikonos 105mm macro lens, Fantasea +12.5 diopter wet lens, Isotta housing, two Sea&Sea YS-D1 strobes

New Reef, Gordon's Bay, South Africa

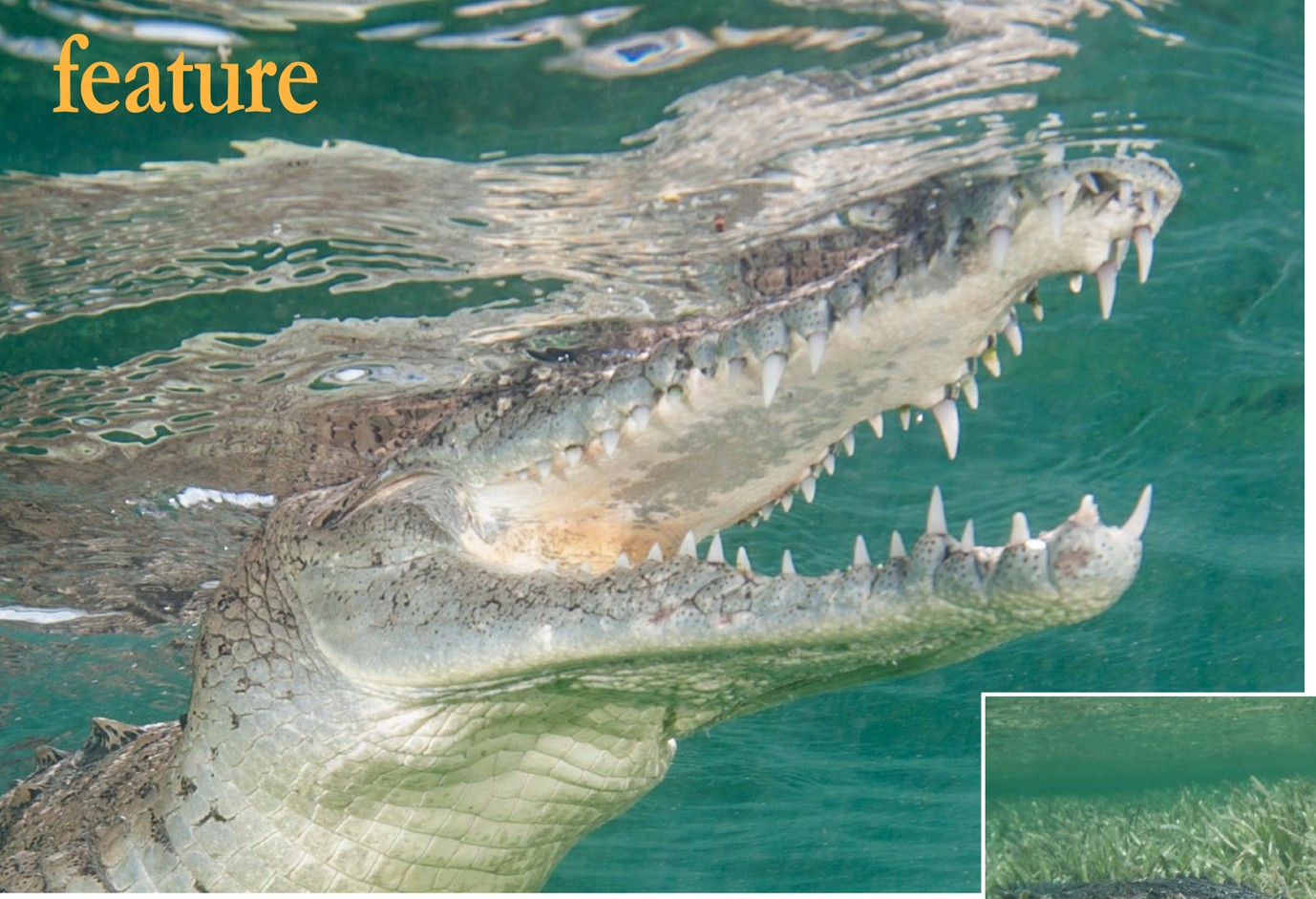
Text and photos by Kate Jonker

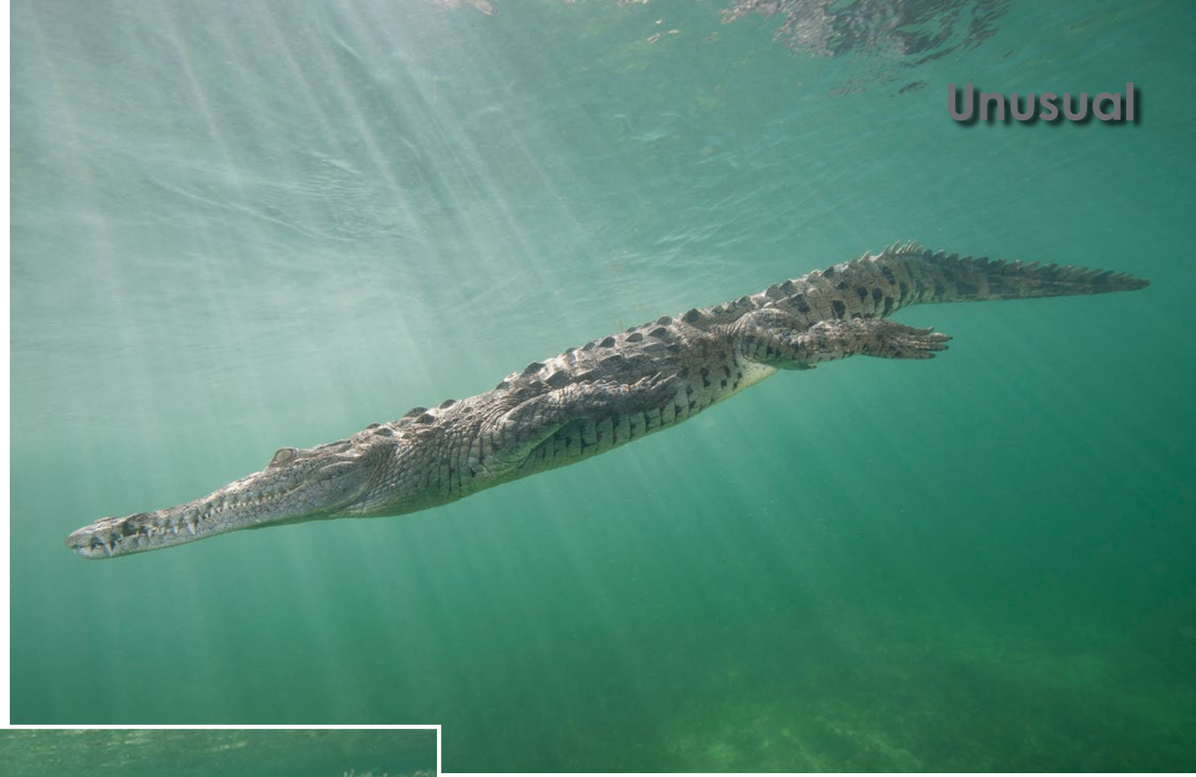
It was one of those perfect days. The sea was as flat as a mirror and we decided to dive one of Gordon's Bay's farther reefs. As the boat skimmed across the ocean, we noticed a boat was already on the reef we had planned to dive. Not wanting to drop us where there would be folk fishing, the skipper decided to head over to the other reef in the area, which was about a kilometre away. As we approached the other reef, my heart sank with disappointment—there were three fishing boats there, too!

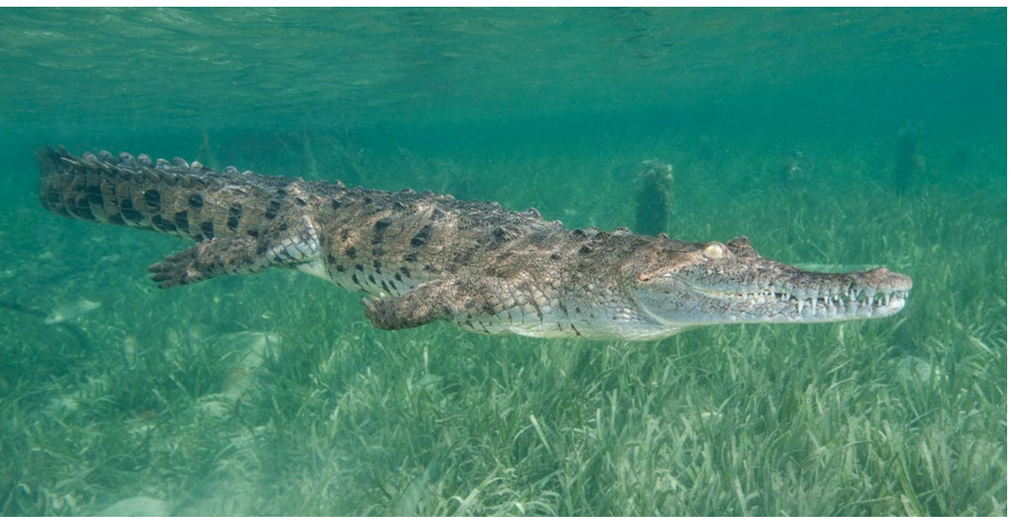
But the skipper had a plan up his sleeve. He knew of an undived reef close by and asked if we wanted to go and take a look. Always ready for an adventure, we all jumped at the chance to dive uncharted territory! We had a diver who mapped reefs on board, and he was also keen to add this to his collection. Before long, we were descending the shot line. The feeling of excitement and anticipation was palpable—what would we see? What would the reef be like?

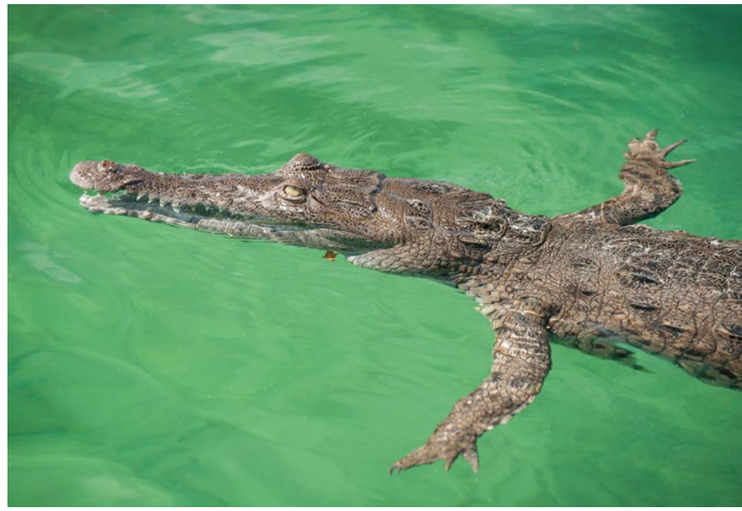
As we approached the reef, an incredible sight greeted us—huge clouds of snow carpeted the floor, broken only by pinnacles of yellow and pink. The seabed was covered with huge clumps of very unusual white choirboys, and the pinnacles were swathed with yellow and pink multicoloured sea fans and huge colonies of fragile yellow bryozoans. Basket stars swayed on larger sea fans and little puffadder catsharks swam lazily amongst the drifts of snow-like choirboys. A huge variety of nudibranchs lounged on the pinnacles, with bellies full from feasting on their favourite bryozoans and sea fans.

All too soon, we made our way slowly to the surface. Once on board, I asked the skipper and mapper to keep the reef a secret as the delicate marine life could easily be damaged by less careful divers. Unfortunately, the mapper did eventually make the coordinates public, but named the reef "Kate's Secret Reef," which was a bit of a contradiction in terms! My motto has always been "expect the unexpected" when diving—and this really was one of those occasions. Visit: **katejonker.com**









Gear used for all underwater images: Nikon D3 camera, 17-35mm lens, Subal housing, two Sea&Sea YS-250 strobes. American crocodile swimming over a shallow sea grass bed (above). Exposure: ISO 200, f/8, 1/250s; Floating at the surface, mouth open (top left). Exposure: ISO 200, f/8, 1/200s; Swimming through sun rays (top right). Exposure: ISO 200, f/9, 1/160s; Resting in a sea grass bed (center). Exposure: ISO 200, f/8, 1/250s

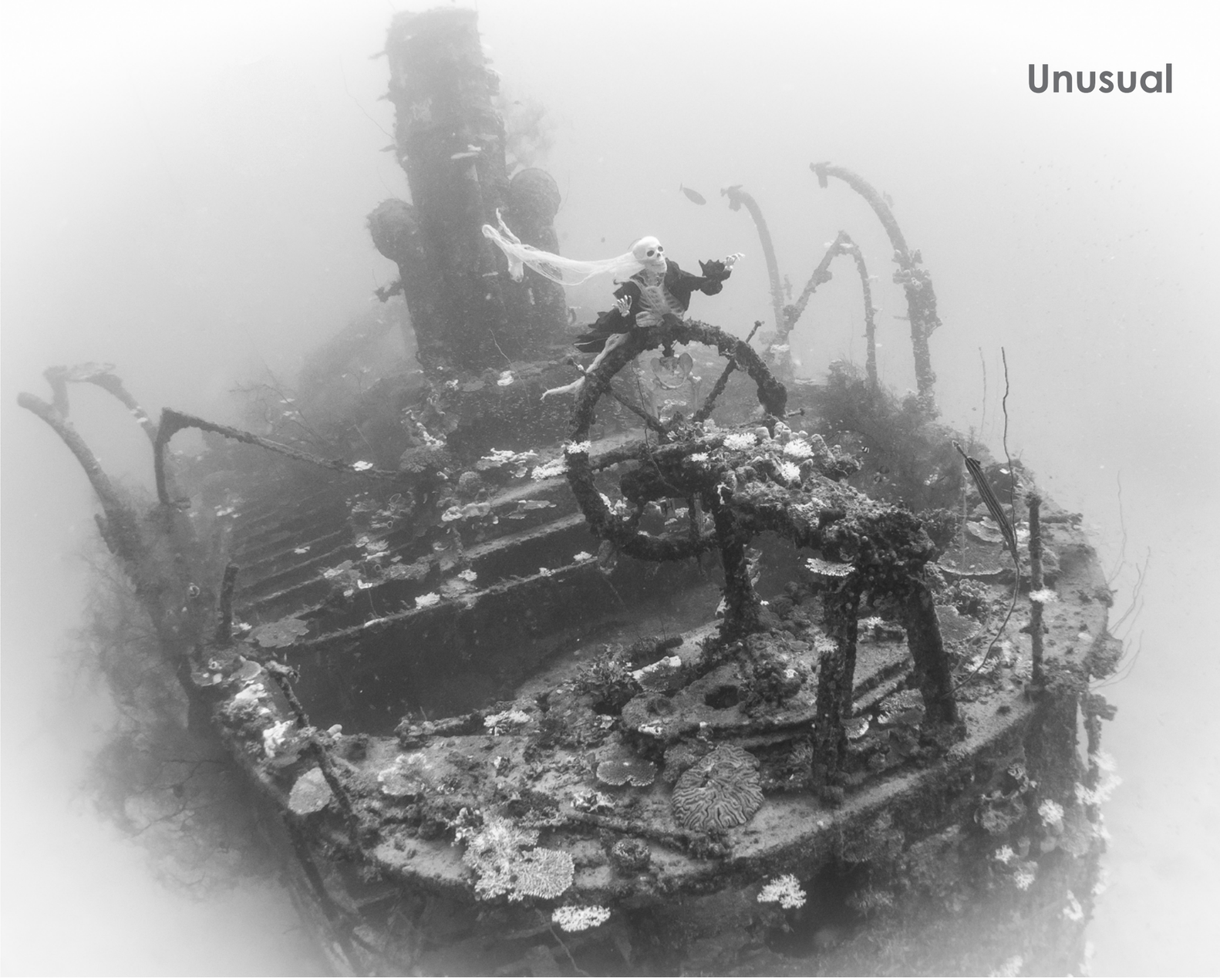
Crocodiles, Garden of the Queen, Cuba

Text and photos by Matthew Meier

The American crocodile is a prehistoric creature that has been on this earth since the days of the dinosaurs and coming face-to-face with them in Cuba was one of the highlights of my diving career. The crocodiles live amongst the mangroves and shallow sea grass beds that make up this marine protected area. Encounters typically occur while on a surface interval between dives, and at times, the water is not deep enough to do anything but snorkel. When in the water, I often found myself looking over the top of my camera housing as a reminder of how close I was to these impressive reptiles. The dive guides control interactions, and only a couple of people are allowed in the water at a time. While the operators have been diving with the crocodiles without incident for many years, the animals have lightning-fast reflexes and can be unpredictable. It is never a good idea to let your guard down in their presence. Visit: **MatthewMeierPhoto.com**

American crocodile floating at the surface. Exposure: ISO 400, f/5.6, 1/320s. Gear: Nikon D3 camera, Nikon 70-200mm lens

Dive buddies of the photographer getting Mr. Bones ready for a dive on the *Palawan* wreck in Kwajalein Atoll of the Marshall Islands (above); Selfie with Mr. Bones during the dive (right); Mr. Bones at the wheel of the wreck (below)



Final dramatic black-and-white image of Mr. Bones on the wreck (right)

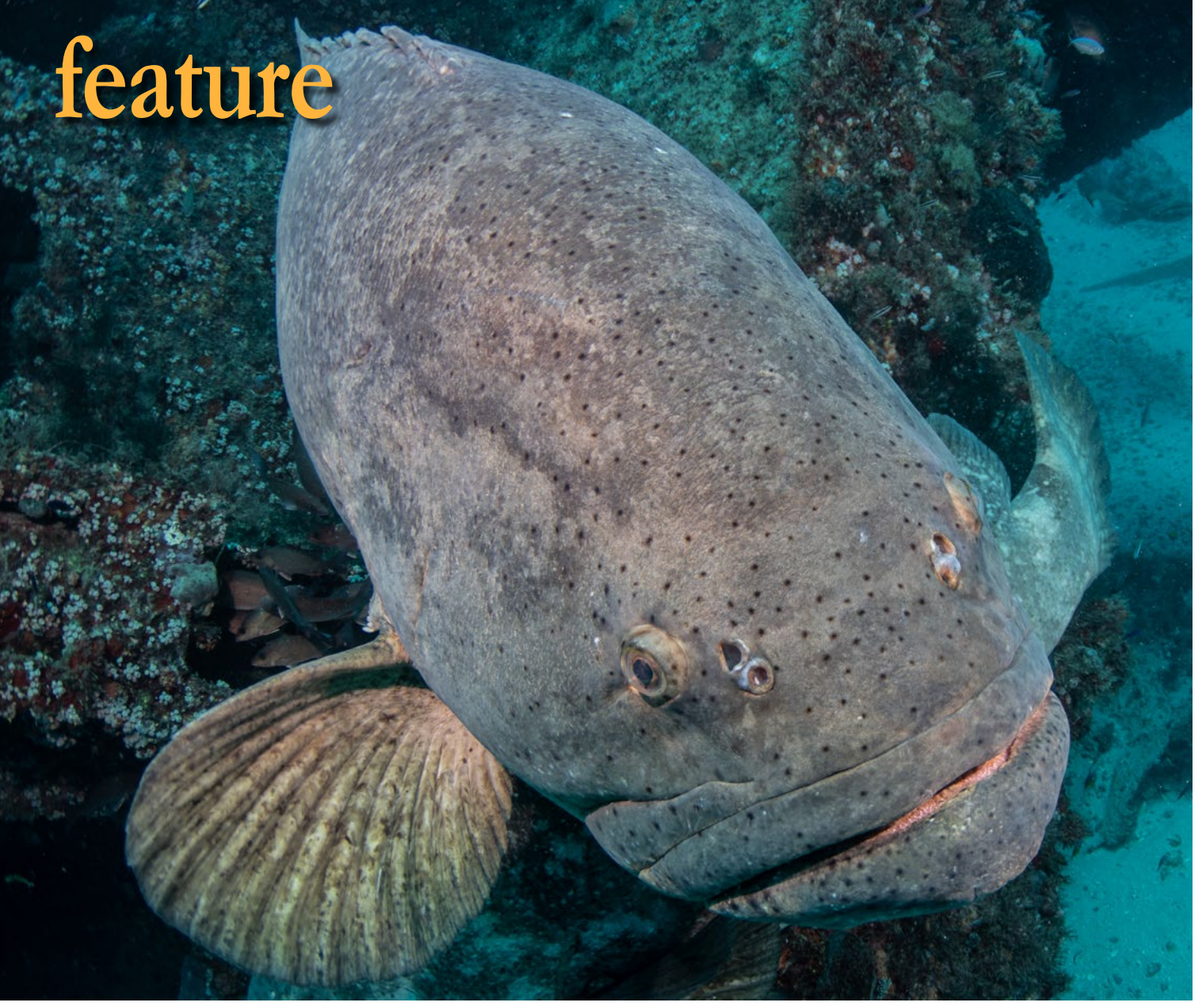
Mr. Bones, Marshall Islands

Text and photos by Brandi Mueller

The best ideas are formed around 11 p.m. surrounded by dive buddies and maybe a few adult beverages, right? In this case, it was the night of Halloween, and while most divers were in ocean-themed costumes, one friend was carrying around a life-size skeleton named Mr. Bones. The brilliant idea was to take Mr. Bones on a dive to our favorite wreck around Kwajalein Atoll, the *Palawan*, which has a very photogenic stern steering wheel.

The next morning, I found myself driving a boat to the wreck with three other divers… well, four actually—can't forget to include Mr. Bones! Not knowing how he would behave underwater, we moored the boat in a shallow, sandy spot and tested his skills. To make him sink, we zip-tied weights to his feet. He gave us the okay sign, and we took him to the wreck.

On the boat ride, we had a slight issue that required emergency spine and rib surgery on Mr. Bones, but a few more zip-ties had him back in one piece. After descending to the *Palawan*, we placed Mr. Bones at the helm, and as my friends exited the scene, I took a few shots. My friend Tim gave me a signal to stop shooting, as he swam over to Mr. Bones to adjust his gauzy shawl. With it floating perfectly in the current, I snapped my favorite shot of the session, and we managed to get Mr. Bones safety back to shore and put him back into retirement until the next year's Halloween wreck dive. Visit: **brandiunderwater.com**



Goliath grouper aggregation heading to a rubble pile (above). Exposure: ISO 200, f/11, FL 14, 1/125s; A goliath grouper smiles (left). Exposure: ISO 100, f/5.6, FL 17, 1/125s

Goliath grouper aggregation within the tunnel. Exposure: ISO 100, f/5.6, FL 17, 1/125s

Goliath Grouper, Wreck Trek, Jupiter, Florida, USA

Text and photos by Gary Rose, MD

It was just another wonderful late summer day of diving the Wreck Trek in Jupiter, Florida, when I found myself in the middle of the annual goliath grouper aggregation. I was surrounded by at least one hundred of these colossal animals. Most were between four to six feet long and a few were as long as eight feet. I then spotted a tightly packed group of ten of them heading to a rubble pile. I took a photo and then they mysteriously vanished, in an instant, into the rubble.

Then, right in front of me was a 600-pounder, looking at me with a goliath grouper smile, and beckoning me to follow… if I dared. She led me into an opening, that with camera and tank, I had to squeeze carefully through.

Suddenly, I was in a tunnel packed with at least 50 goliath groupers. I was surrounded, buffeted, and heaved by these giants. There was no room to turn around. They grunted and rumbled in rage with the resulting shock waves battering me inside and out.

With no way back, I had no choice but to continue forward. The passage was narrow and very dark. I felt like I was going to be crushed at any moment. I sensed the tunnel getting slightly brighter. Was this real or was my hyper-adrenalized mind imagining it? Yes! A blue glow ahead. Increasing light. Suddenly, they battered me one last time in this unique tunnel, and then they pushed me out into glorious aquamarine open water. Visit: **garyrosephotos.com**

Goliath groupers with diver on the *Bonaire* wreck. Exposure: ISO200, f/11, FL 14, 1/125s. All photos were taken with a Nikon D500 camera with a Tokina 10-17 wide-angle lens, in a Nauticam housing with Inon Z330 strobes.

Carving on a building of the submerged Lion City in Qian Dao Lake

Unusual

Fishing boats on Qian Dao Lake (left), one of which served as a diving platform for divers at the dive site (below)

China's Qian Dao – Lake of a Thousand Islands

Text and photos by Don Silcock

By far, my most unusual dive would have to be while I was living in Shanghai as part of an 18-month work assignment in China, where I stumbled on the local diving community, which revolves around training and trips outside of China, apart from diving Qian Dao Lake—some five hours southwest.

Qian Dao Lake was created in 1959 as part of a dam project, which displaced some 290,000 people, many of whom were descended from the founders of the main town, Lion City. The town, which was established about 1,800 years ago, now lies 30 to 40m underwater but was found by the main Chinese TV station, CCTV, during a project about lost ancient treasure. Intrigued, I signed up for the next trip and arranged to bring all my drysuit, dive and camera gear back to Shanghai. Then, on one Friday night in September 2008, we were off for a weekend of adventure!

That night, we stayed just outside Qian Dao National Park; early the next morning, we boarded a ferry to take us across the very scenic lake to the nearest town by the submerged Lion City. A local fishing boat was our dive platform for the weekend and, as we chugged out to the dive site, I noticed a large ship about one kilometre away, which seemed a bit strange. After a briefing and warning that the visibility may be quite bad, we entered the water and started our descent.

At 10m, I could tell that this was going to be an interesting dive, as it went dark rapidly. At about 20m, I was no longer able to see my gauges, and shortly afterwards, my descent halted as I landed in what felt like deep and very soft silt. At that point in time, I was a little concerned—I was in zero visibility, my buddies had disappeared during the descent, I was a very long way from any support, and I was wondering how to explain all this to my wife, should I ever see her again.

After a couple of minutes in the pitch black, I aborted the dive and returned safely to the surface. We did another two dives that day—the story of which was told in a full article on Qian Dao Lake in **issue #43**. I subsequently found out that the large boat in the distance was actually a dredger, which explained the zero visibility on the bottom! Please visit: **indopacificimages.com**

Diver capturing images of the "black morph" manta (above)

Mantas enjoy hovering over divers, as the exhaust bubbles give them a massage (above); Giant oceanic manta ray swimming with Clarion angelfish and a remora (top left)

Waving Manta Ray, Revillagigedo Archipelago, Mexico

Text and photos by Olga Torrey

I was very excited to do a liveaboard trip on the *Nautilus Belle Amie* to the Revillagigedo Archipelago in Mexico. I am not comfortable on long boat rides, but I knew the 24-hour ride traveling 285 miles across the Pacific Ocean would be worth getting seasick for. I had never observed giant manta rays before, and I was looking forward to the experience. I could not wait to capture images of the manta rays and the other pelagic marine life for which these islands are famous.

The trip did not disappoint. We encountered whitetip, blacktip and silky sharks. We observed schools of jacks and torpedo scad. Mexican hogfish and Clarion angelfish, which are only found in this region, were in abundance. Even with all that marine life to photograph, the giant mantas were the stars of the show.

On almost every dive, we interacted with up to six of these gentle giants at a time. The mantas seemed as curious about us as we were about them. They allowed us to get extremely close, and we could tell that they were highly intelligent creatures. The mantas enjoyed hovering above the open circuit divers and allowing their exhaust bubbles to give them a massage.

The most unusual part of this trip happened after the last dive. Larry Cohen (my dive buddy) and I stayed with our dive guide and four mantas, after everyone else was back on the small skiff. We enjoyed what seemed like a beautiful ballet as these large, graceful animals moved and spun in all directions. One manta appeared to pay special attention to us.

Finally, it was time for us to leave the water reluctantly. We climbed onto the skiff for the last time to head back to the main boat. Before the motor started, one manta came half out of the water and used his large fin to wave goodbye to us. If I did not see it with my own eyes, I would never have believed this story. To this day, I have tears in my eyes thinking about it, and I have to wonder how the manta knew this was our last dive.

I captured all images with the Olympus OM-D E-M5 camera in a Nauticam housing. I used the Panasonic 7-14mm wide-angle lens and Sea&Sea YS-D1 strobes for lighting. Please visit: **fitimage.nyc**. SOURCE: DIVENINJAEXPEDITIONS.COM

At Hot Rocks, volcanic gases bubble out of the sand, Sangeang Volcano, near Komodo National Park, Indonesia (top left and center). Exposure: ISO 160, f/14, 1/100s and ISO 160, f/8, 1/80s; Soft and hard coral display near the volcanic bubbles at Hot Rocks, Komodo, Indonesia (top right). Exposure: ISO 160, f/14, 1/100s. Gear for all images: Canon EOS 5D Mark IV camera, Canon 8-15mm fisheye lens, Nauticam housing, Ikelite DS160 strobes.

Bubbling Reefs in the Philippines and Indonesia

Text and photos by Beth Watson

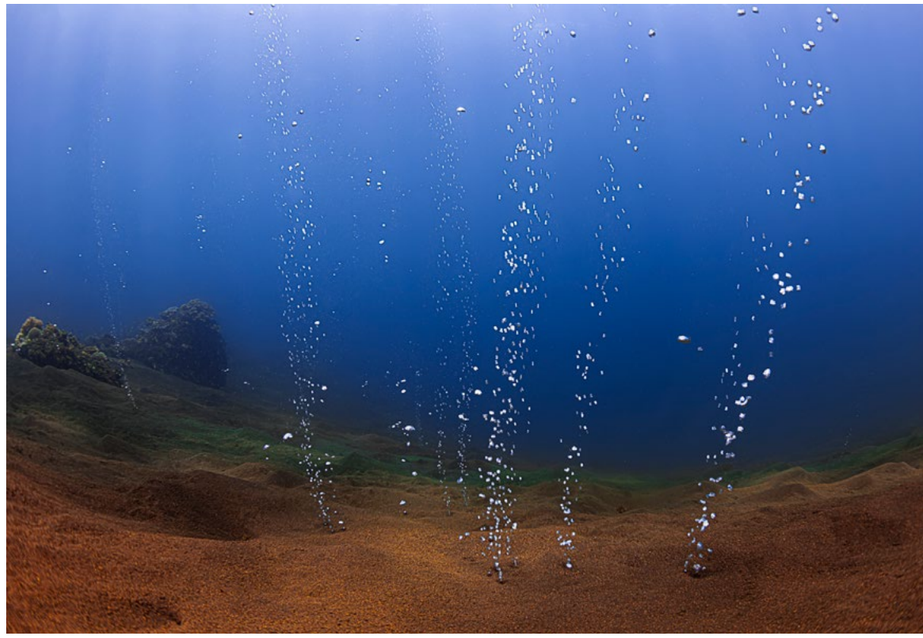
Two dive sites piqued my interest and curiosity with their unique topography, with both featuring volcanic bubbles. The first dive site is located in the Philippines, just south of Chicken Feather Island, where a small volcanic crater lies. The bottom is covered with volcanic stones. Bubbles of sulphuric gas rise up to the surface, creating shimmering apparitions in the water column.

The rocky substrate is very warm to the touch. In fact, fellow divers and I were able to boil an egg there during one of our dives. The rest of the dive site is varied and diverse, with stunning scenery and a plethora of marine life congregating around and living on the coral formations.

The second dive site is located in a volcanic crater, which is tricky to locate. You will need an experienced guide who is knowledgeable of the area to find it. The Hot Rocks dive site is located in the waters around the volcanic Sangeang Island in Indonesia. The volcano is active, providing streams of volcanic gases rising from the substrate, which creates a breathtaking underwater landscape.

It is dramatic, with the deeper area sporting colorful coral formations and sandy slopes, black coral bushes, gorgonian sea fans, pygmy seahorses, octopus, lobster and nudibranchs.

The Chicken Feather Island and Hot Rocks dive sites are unique and perfectly suited for underwater photography. They both offer diving experiences you will never forget. Please visit: **bethwatsonimages.com**



Sulphuric gas bubbles rise to the surface around Chicken Feather Island, near Puerto Galera, Philippines (above). Exposure: ISO 160, f/9, 1/125s; Colorful anthias swarming a coral head near the volcanic crater, Chicken Feather Island, Philippines (left). Exposure: ISO 160, f/9, 1/125s

Edited by
Matthew Meier

POINT & CLICK ON BOLD LINKS

Equipment

Ocean Reef Neptune III Full Face Mask

Discover the most advanced full face mask ever made by Ocean Reef. Designed with an integrated, vertical second stage regulator and a new wider field of vision shield, the mask offers lower volume and increased comfort and fit. An improved surface air valve and pre-dive lever keeps the mask from fogging or free-flowing. Sold in three different set configurations, including the first stage, back-up conventional mask, QC hoses, octopus, pressure gauge and backpack. **oceanreefgroup.com**

SEAC Screen Dive Computer

Featuring a large, easy-to-read display, Screen is the latest dive computer offered by SEAC. Available as a console with a pressure gauge or as a wrist computer, Screen provides well-defined, easy two-button operation and supports air, nitrox and other gas mixes, as well as gauge and freediving modes. Screen has a user-replaceable battery and is depth-rated to 100m. **seacsub.com**

Mares Magnetic Connector

The perfect solution for quickly and securely attaching almost any diving accessory to your BCD. Rated to hold up to 132 lbs (60kg), the connector provides 360-degree rotation for optimum placement and comfort. Single-handed operation is safe and secure even when fully loaded. **mares.com**

Ear Pro

contains a formulation that repels water and comes with natural anti-infective properties, which help to protect the ear from exposure to water-borne diseases. It is an effective solution against trapped water and related ear issues. Ear Pro gently coats the outer ear canal with a highly water-repellent layer, ensures that water leaves your ear canal, and protects your ears from infections. Available as a spray and is recommended for application every two hours during water exposure to both ears. **earpro.co**

Apple AirTag

For those of us that need a little extra help keeping track of our keys, wallet or other valuables, Apple has introduced the AirTag. This small circular device can be tracked with Bluetooth using the Find My app, similar to other Apple products. Available individually or in packs of four, each AirTag requires accessories, sold separately, for attaching to an item. **apple.com/airtag**

AV Underwater Technologies' Electronic Closed Circuit Rebreather BRIZ

The BRIZ rebreather is designed for use in challenging expedition conditions. It offers a low-profile (only 14cm) backmount design and provides maximum safety and reliability. The simple and convenient design allows easy access to all the elements: batteries, sensors, scrubber, cylinders—without any additional disassembly of equipment; no additional tools required. **av-uwt.com**

opinion

Making The Right Choice

DON SILCOCK

Text by Simon Pridmore
Photos by Matthew Meier
and Don Silcock

This issue's column tells the story of two dives, which took place half a world away from each other. The dives placed two divers in a situation where they had to make a choice. What would you have done?

Peter's choice

Peter was in the Galapagos Islands. It was the last dive of the last day of a 12-day journey around the southern islands and up north to Wolf and Darwin. He and his fellow divers had seen almost everything on their wish list at some point during the trip, but they had not seen any whale sharks.

Peter was waiting on the surface for the other divers to get back into the tender boat, when some sixth sense made him glance down. Passing not more than 10m below was the unmistakable starry-night-patterned back of a large whale shark. His initial shock turned into action. He knew he had to move quickly. Not taking his eyes off the huge fish, he jammed his regulator into his mouth, deflated his BCD and dropped below the surface. He inverted himself and kicked down. No doubt sensing a threat, the whale shark dived too.

Peter followed, equalising like crazy and finning as fast as he could. With deceptive ease, the whale shark was putting ever more distance and depth between them. As he plunged down, a sliver of self-awareness entered his mind. What was he doing trying to keep up with a plummeting whale shark, at the end of the final dive of the last day, with a flight scheduled for the following day and not much air in his cylinder? What was he hoping to get out of this? A world-class photograph? His small point-and-shoot camera was nowhere near up to the task. The best he could hope for would be a shot of the massive tail. Was he after a better view? He had already had the best view he was going to get, when he was still on the surface, as the giant fish cruised by beneath. The ocean around him was dark and green. Below, it became even darker.

He stopped finning, aimed his small

camera at the whale shark's large back and tail receding into the gloom and clicked. He checked his contents gauge, blinked in surprise at how little air he had left, and made a slow ascent back to the surface. He popped up a short distance away from the tender boat and was swiftly spotted.

The rest of his team were very pleased to see him. They had feared the worst after they lost sight of him. When Peter got back on the liveaboard, he downloaded his photos from the dive and then lightened and increased the contrast on the last hastily snapped shot. The whale shark was almost invisible in the murk. All you could see were the distinctive white flashes on a light grey, vaguely shark-shaped background.

Peter looked at the picture and reflected on the fact that this was a small reward for risking his neck. He wondered again at what had possessed him to embark on his wild ride and was relieved that he had come to his senses in time to put the brakes on and get back to the surface before he ran out of air completely.

Andrew's choice

Andrew was on his third dive of the day in Indonesia's Banda Sea. Over the previous couple of days, he and his group of divers had seen large schools of hammerhead sharks out in the blue as well as a few individuals that had come close to check out the divers, before veering away.

This dive, however, was very different. The divers had already been in the water for some time when their guide spotted a huge group of hammerheads swimming towards them. The divers were at a depth of around 27m and the sharks seemed to be about 15m below them. Andrew knew that if he stayed where he was, he would only get to see the school passing by in the distance, as on their previous dives. This time, he wanted to get closer.

There was a strong current running, but he began to crawl down the slope, using his pointer with one hand like a grappling hook, jamming it behind rocks and into crevices. The other hand was occupied with his video camera, which he directed at the approaching hammerheads. He arrived at a depth of 38m and wedged himself into the slope to get a stable base to film from.

The view was incredible. The school of hammerheads flowed past him, some almost within touching distance. They were in a long line, their bodies undulating effortlessly as they cruised by. Still, they kept coming. He heard someone tapping insistently and glanced up. It was the dive guide, motioning him to ascend to a shallower depth.

Andrew knew that he must be low on air and was probably in deco, but he did not dare take his eye off his viewfinder. He was getting the best footage he had ever shot. He ignored the guide and kept filming the school as it patrolled past him. Soon, they were gone.

Just as he was about to ascend, he turned and saw, in the distance,

MATTHEW MEIER

DON SILCOCK

another big school of hammerheads approaching. Without thinking, he swam towards it, the adrenaline pumping through his veins. This was truly the dive of his life. The hammerheads almost filled his screen, and they were coming ever closer.

Then, he ran out of air.

He tried to take a breath, but there was nothing there. He looked around. The guide and the other divers had left. All he could do was try to get to the surface before he drowned. He swam up, with no other thought in his mind but that he had to get air. His regulator was still in his mouth. He was not going to make it. He had to take a breath. He inhaled cautiously and got a mouth full of sea instead of air. The water touched his throat and he choked, spitting the water out.

He was still finning as hard as he could, up towards the light, the regulator mouthpiece gripped between his teeth. Almost immediately, the urge to breathe returned, an urge he could not resist. He inhaled again, expecting nothing, but miraculously there was air. It was not much, but it was enough to get him through the final few metres. He broke the surface, removed his regulator and took several lungfuls of air, gasping. He inflated his BCD orally and waited for the boat to pick him up.

The guide had witnessed the whole thing and was as relieved as Andrew was that he was still alive. He made him breathe pure oxygen for a while and told him that he would have to skip the next day's diving, the final day of their trip, so that he would have a good 48 hours between diving and flying.

Fortunately, Andrew suffered no symptoms of decompression sickness following his rapid emergency ascent.

Every time he subsequentlyshowed the video from the dive and told this story (which was often), he would always say he had no regrets about doing the dive the way he did.

Would he do it again? "No way," he shakes his head. "But that is because I have already done it!" You would notice, however, that when he says this, his wife, the mother of their two children, does not join in with the nervous laughter that always follows.

Dealing with dilemmas

Both these guys lived to dive another day, which is just as well; otherwise, we wouldn't know their stories. A diver who finds that they are in a position of having to make a crucial choice on the spur of the moment, when the adrenaline is running and narcosis is dulling the brain, is always at risk of making a flawed decision and taking the wrong course of action.

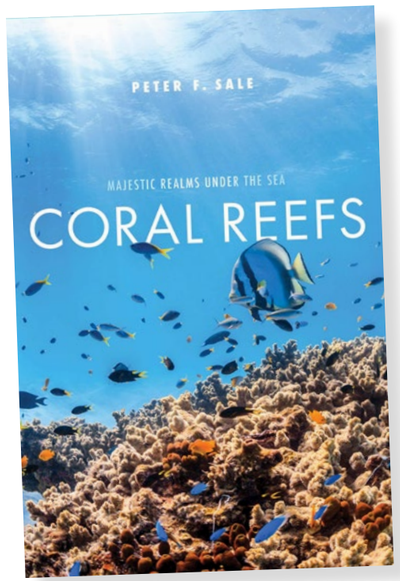
At some point, any of us may find ourselves confronted with a dilemma similar to the one these two guys had to deal with. Self-discipline is the key, of course, but you don't know if you have got enough of it—if you are a Peter or an Andrew—until the moment arrives and you are put to the test.

A good strategy is to establish some personal rules to dive by. Work these out in the cold light of day, rationally and with plenty of sober reflection. Your list may include things like: "Once I am on the surface, the dive is always over," "Never go into deco on a single tank," "Always surface with at least 30 bar," or "Always carry a pony bottle below 30m." You get the idea.

You choose your own rules; then make a promise to yourself to stick to them, no matter what. Then, there is a better chance that you will make the right choice when your turn comes. ■

Simon Pridmore is the author of the international bestsellers Scuba Confidential: An Insider's Guide to Becoming a Better Diver, Scuba Professional: Insights into Sport Diver Training & Operations *and* Scuba Fundamental: Start Diving the Right Way. *He is also the co-author of the* Diving & Snorkeling Guide to Bali *and the* Diving & Snorkeling Guide to Raja Ampat & Northeast Indonesia. *His recently published books include* The Diver Who Fell From The Sky, Dive into Taiwan, Scuba Exceptional: Become the Best Diver You Can Be, Scuba Physiological: Think You Know All About Scuba Medicine? Think Again! *and the* Dining with Divers *series of cookbooks. For more information, see his website at:* ***SimonPridmore.com****.*

media

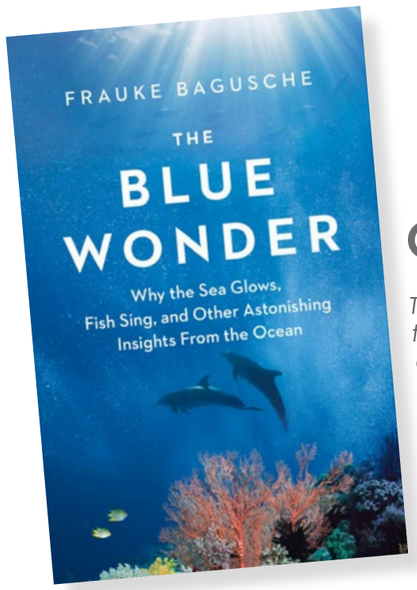


Coral Reefs

Coral Reefs: Majestic Realms under the Sea, by Peter F. Sale

Since the 1970s, coral reefs worldwide have lost more than half of their living coral. An introduction to the beauty, wonder and complexity of coral reefs, this book reframes the challenge of restoring coral reefs as a noble venture that steers us into safe waters. It also relates how their decline is an existential warning to humanity by depicting them within the wider context of global climate change.

Publisher: Yale University Press
Date: 25 May 2021
Hardcover: 288 pages
ISBN-10: 0300253834
ISBN-13: 978-0300253832



Oceans

The Blue Wonder: Why the Sea Glows, Fish Sing, and Other Astonishing Insights from the Ocean, by Frauke Bagusche

Take a deep dive with marine biologist Frauke Bagusche and see the oceans in a new light. Read about fish that communicate by singing loudly, an octopus that is also a master impersonator, why the sea glows at night, weddings amongst corals, underwater drugstores and more. Using scientific discoveries and her own research, the author writes with the heart of a poet to rekindle our love for the sea and reignite our desire to protect it.

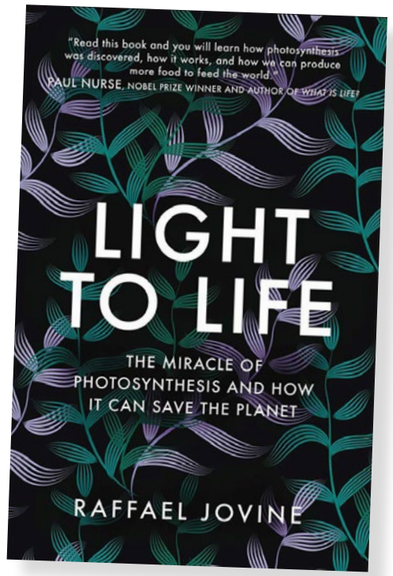
Publisher: Greystone Books
Date: 8 June 2021
Hardcover: 304 pages
ISBN-10: 1771646047
ISBN-13: 978-1771646048

Ocean Conservation

Conserving the Oceans: The Politics of Large Marine Protected Areas, by Justin Alger

This book details efforts to boost the pace and scale of Marine Protected Areas. Through an analysis of domestic political economies—and based on three case studies in the US, Australia and Palau—it explains how states have protected the oceans while remaining responsive to business interests. Author Justin Alger examines the reach and limits of business influence, showing how the domestic political economy of a specific ocean space can reshape a global norm to adapt to local economic realities. He provides a critical analysis of the processes by which global environmental norms become domestic policy, while acknowledging global progress and the growing ambition to conserve ocean ecosystems.

Publisher: OUP USA
Date: 6 May 2021
Hardcover: 240 pages
ISBN-10: 0197540538
ISBN-13: 978-0197540534



Sealife & Photosynthesis

Light to Life: The Miracle of Photosynthesis and How it Can Save the Planet, by Raffael Jovine

Biologist Raffael Jovine shows how photosynthesis can lead the way to the future: by greening the desert, bringing oceans on land, planting mangrove forests and oyster banks. He describes how this process has the power to grow food, reshape continents, drive biogeochemical cycles, stabilise the climate and regulate the weather. In short, by harnessing it, we can regenerate the planet and change how we interact with it.

Publisher: Short Books
Date: 22 April 2021
Hardcover: 224 pages
ISBN-10: 1780724705
ISBN-13: 978-1780724706

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Long-finned pilot whale cow with her calf, off the coast of Ireland

Buoy in Celtic Sea tracks oceanic noise

The waters of the Celtic Sea off the coast of Baltimore in west Cork, Ireland has been playing host to a two-tonne, 13ft yellow buoy since March 2021.

Equipped with an autonomous hydrophone, the buoy's function is to conduct for the first time real-time acoustic monitoring of the water's cetaceans to assess how oceanic noise pollution affects them. Deployed as part of the Smart Whale Sounds project, it will also track the distribution and behaviour of whale species in real-time and be used to train machine learning models to identify different species' calls. The data collected will be used to create a marine wildlife detection and classification model in Irish waters, which can be applied to other regions worldwide.

ORCA

The project is being undertaken by Ocean Research and Conservation Association (ORCA) Ireland, a non-profit organisation based in Cork, in partnership with Rainforest Connection and supported by Huawei Ireland.

ORCAIreland's Co-Founder and Executive Director Emer Keaveney told the Irish Examiner that it was a "brilliant opportunity" for Irish scientific research to lead the way globally, and an example of how technology can be utilised for environmental purposes. In a video interview with Sky News, she said, "We know very little about the rate of ship strikes in Irish waters and how often whales are hit by ships, and we also know very little about how loud our ships are."

Reducing ship strikes

She added that using the organisation's Observer App, mariners can be notified whenever there is a potential whale in the area, and thus "what they can do is they can reduce the speed and then that will limit the impact of noise pollution, [...] it will also reduce the risk of ship strikes."

Sounds informing science

Topher White, Chief Executive of Rainforest Connection said, "No matter where we look on earth, life expresses and asserts itself through sound. There's no better way to tap into the subtlety and the essence of ecology than through how nature calls to itself.

"To capture this at scale within our oceans, and harness the power of cloud-AI and big-data analysis to gather the ecological insight, is the beginning of an unprecedented era of ambitious scientific discovery and critical conservation work," he added.

Presently, 25 species of resident and migratory cetaceans live in Irish waters, comprising a third of all cetaceans found worldwide. The south coast is one of the world's most important foraging, resting and reproductive habitats for cetaceans. ■ SOURCES: IRISH EXAMINER, CYPRUS SUBSEA

Whales at Dana Point, California, USA

INCIDENCEMATRIX / FLICKR COMMONS / CC BY 2.0

First Whale Heritage Site in the Americas

Business rivals worked together to make Dana Point a Whale Heritage Site. In late January 2021, the World Cetacean Alliance (WCA) named Dana Point, California, a Whale Heritage Site, a first for in the Americas.

The reasons were obvious: As one of the world's top whale-watching destinations, it hosts a variety of whales all year round, including the blue whale. It has more dolphins per square mile than anywhere in the world. Dana Point also has a small non-commercial harbor, community support, and undertaken public outreach and education, advocacy and research efforts.

Although the location received the award due to its inherent merits with regard to cetaceans, this might not have come about if not for the efforts of the owners of two competing whale-watching companies at Dana Point.

Rivals with a common goal

Donna Kalez is the Co-President of Dana Wharf Sportfishing & Whale Watching, while Gisele Anderson is the Vice President at Capt Dave's Dana Point Dolphin & Whale Watching Safari.

They had met each other at an event and hit it off. They soon realised that despite being from rival companies, they shared a common goal in wanting to promote Dana Point as a premiere dolphin and whale-watching destination. Thus, they worked together to achieve this, insofar as to even travel together to different hot spots around the world to see dolphins and whales. On such trips, they saw the same things again and again.

"We would go to those hot spots and then I would think … this is not as great as what we have … For instance, you can go to some destinations, and they'll have whales, but only seasonally. So you can only go for a short period of time. Or, they'll have whales, but the weather precludes you from being able to go any time of year," said Anderson, in an interview with KCRW.

In other instances, the places did not have the numbers: "They'll have dolphins, for instance, they'll be excited about a pod of dolphins that's about fifty to a hundred strong, and for us, our average-size pod is several hundred, and we see megapods of a thousand or more on a weekly basis. And we see pods as big as 10,000..." she added.

Recognition

Together, Anderson and Kalez progressively strived towards their mutual goal. And in 2019, working with a lawyer, they managed to get Dana Point trademarked as "The Dolphin and Whale Watching Capital of the World." Then in January 2021 came the WCA's recognition of Dana Point as a Whale Heritage Site.

Speaking with *Orange Coast Magazine*, she said, "We have to up our game and increase education, public involvement. We really are a poster child for the program. They loved the fact that millions of kids come through the Ocean Institute. They were really excited about our Festival of Whales. But this is an ongoing process."

Kalez added, "When my dad started this, it was his dream that everyone would know that the California gray whale travels through here November through May. It makes me very proud that that's something we've accomplished. That we now have the credibility of the world." ■

SOURCES: WHALE HERITAGE SITE, USA TODAY, KCRW, ORANGE COAST MAGAZINE

NOAA NMFS / WIKIMEDIA COMMONS / PUBLIC DOMAIN

Pair of common dolphin

Share your views on Scotland's first cetacean conservation strategy

Here is the opportunity to share your opinions, with regard to the cetaceans in UK waters—by taking part in the public consultation on the first UK Dolphin and Porpoise Conservation Strategy.

Focusing on nine of the most commonly found dolphin, whale and porpoise species in UK waters, the strategy has been developed by the Scottish Government, in collaboration with the UK Government, the Welsh Government and the Northern Ireland Executive.

Its objective is to ensure the effective management to achieve and maintain the current favourable status of the nine species. It highlights certain pressures where further research or extra management measures may help to improve the conservation of marine mammals.

According to Scotland's Natural Environment Minister Ben Macpherson, "This consultation is a milestone for marine protection and includes a range of measures that will help us to conserve dolphin, whale and porpoise populations in our waters, and allow us to better understand and address the pressures they face.

He added that it built on "the work we are already doing to safeguard bottlenose dolphins, harbour porpoise, minke whales and Risso's dolphins through our Marine Protected Area (MPA) network, which now covers in excess of 37 percent of our sea area."

You can review and comment on the strategy from now till 14 June 2021 at: **consult.gov.scot**. ■

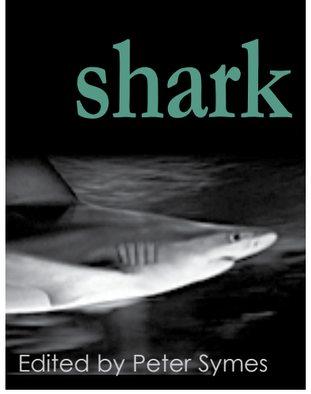
SOURCES: SCOTTISH GOVERNMENT, GRAMPIAN ONLINE, THE SCOTSMAN

FACT FILE

According to Sea Watch Foundation, based on the results from their Whale and Dolphin Count last year, the waters along the Scottish coastline continue to be a hot spot for cetaceans as well as other marine animals like sunfish and seals.

Numbers-wise, we are talking about sightings of nine cetacean and four non-cetacean species. Harbour porpoises were the most commonly seen species across the UK, with common dolphins and bottlenose dolphins coming in second and third respectively.

At the end of the nine-day event, which involved both scientists and volunteers, 9,784 individual dolphins, whales and porpoises were reported in 1,348 sightings across the Unnited Kingdom. ■



Sharks use Earth's magnetic field to find their way

By subjecting sharks in a cage to magnetic fields that replicate those found in different geographical locations, scientists showed bonnethead sharks can indeed use Earth's magnetic field to navigate.

PHOTO ILLUSTRATION COMPILED WITH IMAGES FROM PETER SYMES AND PIXABAY

Since at least the 1970s, researchers have suspected that the elasmobranchs—a group of fish containing sharks, rays, skates and sawfish—can detect magnetic fields. However, up until now, no one had shown that sharks use the fields to locate themselves or navigate.

By exposing sharks to certain magnetic cues, researchers from Florida State University have now managed to demonstrate that sharks not only have an ability to detect Earth's magnetic field, they are also able to use it to travel long distances with accuracy.

The scientists captured the juvenile bonnetheads in St George Sound, off the Florida Panhandle, and placed them in a room-sized pool surrounded by copper wire. This allowed researchers to simulate magnetic cues from the capture site and from positions roughly 375 miles north and south.

When the applied field was the same as at the collection site, the researchers found that the animals swam in random directions. And when applying a field similar to the northern site, the sharks appeared disorientated.

However, when subjected to the southern magnetic field, the sharks persistently changed their headings to swim north into the pool's wall, toward their preferred habitat, which told the researchers they were using this information to navigate home.

Researchers still do not know how sharks derive positional information from the magnetic field, such as a map and compass information. As magnetic fields go right through an animal, magnetic field receptors could be placed anywhere in an animal's body, and there is no obvious place to look for such receptors. One study alleges they may be located in the naso-olfactory capsules of sharks. ■ SOURCES: CURRENT BIOLOGY, ROYAL SOCIETY.

tech

Mixed team of open circuit and closed circuit rebreather dive buddies

Text by Michael Rothschild, MD
Photos by Michael Rothschild and Alice Chong

Nowadays, more and more recreational divers are coming into contact with technical rebreather divers, perhaps even being buddied up with one on a dive. What follows are some good things for open circuit divers to know about closed circuit rebreathers. Michael Rothschild gives us a quick glimpse into rebreather diving and what one can expect when diving in a mixed team.

Bill and Tony had been dive buddies for several years, frequently visiting the local wrecks near their shore town. Tony had been content doing single tank recreational dives, but Bill had gotten into technical diving and had recently certified on a closed circuit rebreather. Given their longstanding friendship and the lack of other local rebreather divers, Bill had continued to dive with Tony, visiting the same wrecks and adjusting the dive plan so that Tony would never get close to his gas or decompression limits.

Tips for Mixed Teams *of OC & CCR Divers*

MICHAEL ROTHSCHILD

With the increasing popularity of rebreathers, it is becoming more and more likely that an open circuit (OC) diver will be buddied up with someone on a closed circuit rebreather (CCR). This may be a regular team, or a buddy pair formed when two people who are vacationing alone decide to dive together. It is even possible that an OC diver will encounter a rebreather diver from another team, and rescue or assistance might be necessary.

This review came out of an online discussion of helpful things for a relatively inexperienced OC diver to know about CCRs. It is NOT intended to be a comprehensive introduction to rebreathers, but rather a quick overview of things that an OC diver should learn to be a safe member of a mixed OC/CCR team. Also, I am assuming here that any safe team will discuss gas and dive planning ahead of time based on the individual limits of each member; that is not what this article is about.

Some rebreathers are of the semi-closed design (SCRs), which work differently than CCRs. For the sake of clarity, I have used the abbreviation CCR throughout this article, but much of this applies to SCRs as well.

A range of configurations

Please remember that rebreathers are much less standardized than open circuit gear, and there is a wide range of equipment configurations and procedures in use. For the purpose of simplicity, I am considering a common CCR setup for recreational diving within no-decompression limits (NDL). It is true that some CCR divers


MICHAEL ROTHSCHILD

have complex gear such as special gasses that are unsafe to breathe in shallow water or multiple bailout tanks. However, it is fairly unlikely that such a diver would be in a mixed team with the OC diver for whom this article is intended.

It would be confusing and counterproductive to try to cover all possibilities in an article of this scope. Therefore, any mixed dive team MUST have a thorough discussion before entering the water about the specific gear configuration being used, and the expectations for each team member during the dive and in an emergency.

Prebreathe

One thing to know about CCR divers is that we love to talk about our gear at all times EXCEPT during our pre-dive checks. If you see divers breathing through their rebreathers on a dive boat, do not ask them questions, and if you do, do not assume they are rude if they do not answer. This is the "pre-breathe"—several minutes of breathing through the unit before entering the water, to make sure that all systems are working well. Even before or after the pre-breathe, there are a number of things on the checklist that we may be going over, and that is not the time to be chatty.

If you see divers breathing through their rebreathers on a dive boat, do not ask them questions, and if you do, do not assume they are rude if they do not answer. This is the "pre-breathe"—several minutes of breathing through the unit before entering the water, to make sure that all systems are working well.

Rebreather basics for OC divers

From the point of view of an OC buddy in a mixed team, there are a few basic CCR concepts that are important to know. A CCR works by circulating a single breath in a closed pathway (the "loop") in which there is a container of a chemical (a "scrubber") that removes the carbon dioxide (CO_2) that the diver produces.

The machine also has the ability to add gas from two tanks into the loop: pure oxygen (O_2) and "diluent" (which may be air). The O_2 replaces oxygen consumed by the diver, while the diluent keeps the loop filled with gas as depth and ambient pressure increases. By the appropriate addition of these two gasses, the rebreather diver is able to maintain the partial pressure of oxygen (PO_2) in the loop in the breathable range—too high or too low is lethal.

Different designs

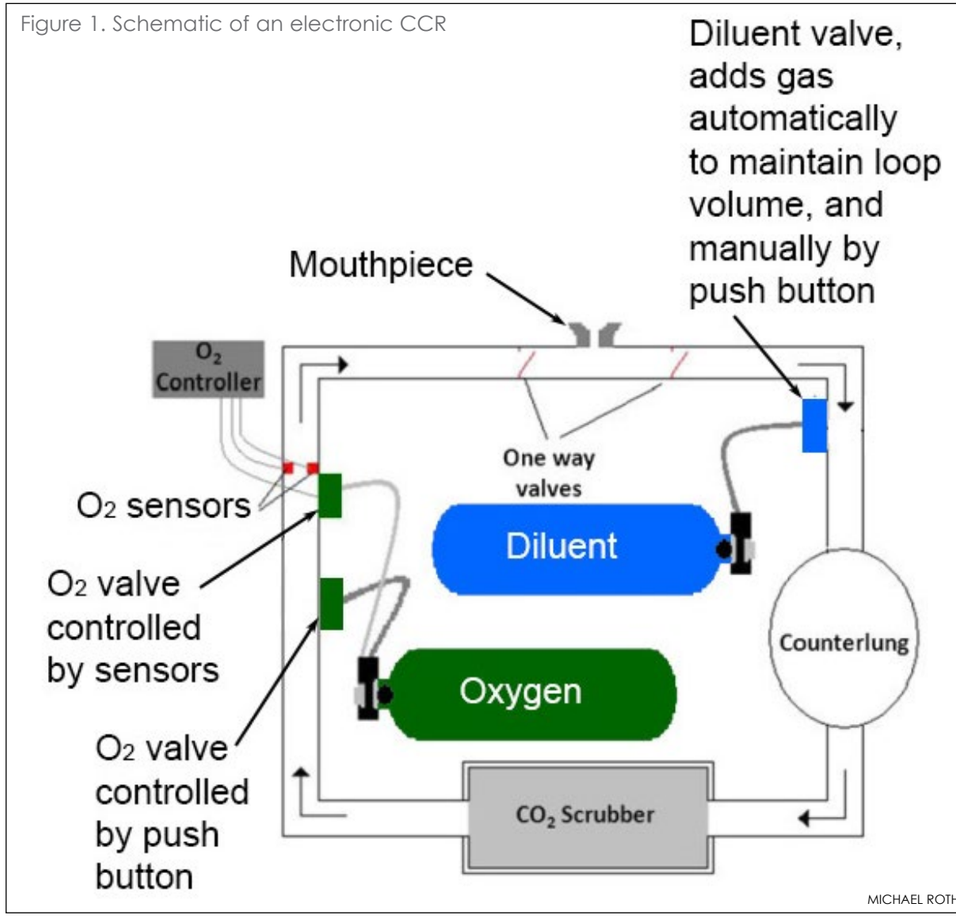
Once again, this is not meant to be a comprehensive overview of rebreathers—there are different types of rebreather design, and I have simplified the diagram by showing something called an eCCR (electronic CCR) in which oxygen addition is partially controlled by a computer that monitors oxygen sensors. Other designs involve the continual flow of oxygen into the loop and reliance on the diver to manually replace consumed oxygen (mCCR).

A very important button

But with any design, there will be a button somewhere to allow the manual addition of diluent to the loop. This may be on the ADV (automatic diluent valve, which adds gas as needed to compensate for increased ambient pressure), or on a separate manual addition valve (MAV). This is one of the two most important rebreather controls for the OC diver to understand (along with the bailout valve, as you will see below).

Some CCRs have an inline shutoff valve on the ADV gas supply hose; this must be opened if you are going to use the ADV button to add diluent to the loop. There will also be a MAV for O_2, in addition to some method of automatically adding oxygen. (See Figure 1.)

Figure 1. Schematic of an electronic CCR



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During the pre-dive discussion, the CCR diver will show you where these buttons are. It is crucial to remember which is which. As we will see below, in some emergencies, you might add diluent for an unresponsive diver, but NEVER oxygen, which can cause life threatening spikes in oxygen levels. Adding diluent will ALWAYS introduce fresh gas of a known, safe composition into the loop. The only exception to this rule would be "hypoxic diluent," which does not have enough oxygen to support life in shallow water, but as mentioned above, that is beyond the scope of this article.

Flushing the loop with diluent can help in situations where the oxygen levels are too low or high, or where there is a buildup of excessive CO_2 in the loop. Remember that this will also add buoyancy to the CCR diver and therefore will require venting of the loop. Discuss this option with your buddy ahead of time.

Bailout

The term "bailout" refers to a complete, independent OC system carried by rebreather divers—a tank with a first and second stage regulator. In some designs, bailout and diluent come from the same gas source, and there may be multiple tanks for different depths, but the idea is that the system will always supply breathable gas no matter what is happening with the rebreather itself. The bailout system has to have enough gas to allow for a safe ascent if the rebreather became unusable for any reason during the dive.

In rebreather training, there is a low threshold for getting off the loop and onto this backup OC system—"When in doubt, bail out!" This is especially important since some of the problems that CCR divers can have related to gas problems in the

loop are first detected by a strange feeling that something is not right. Bailing out early can be life-saving in this situation. Often, this lets the rebreather diver fix something that will let them return to the loop and finish the dive, but enough gas must be carried to reach the surface on OC alone if necessary.

Two valve types: DSV vs. BOV

Switching from breathing through the loop to breathing from the bailout tank may be done in two ways, corresponding to two different designs for the CCR mouthpiece. The simplest design is the dive-surface valve (DSV). This is a switch that closes off the loop from the mouthpiece—it must be open to breathe from the loop, but closed whenever the loop is out of the diver's mouth to keep from flooding the rebreather. Divers using a DSV have a standard OC regulator connected to the bailout (often bungeed under the diver's neck or to the tank). When bailing out, they close the DSV and switch to this regulator.

Another option is something called a bailout valve (BOV). The BOV consists of an OC regulator built into the loop, but connected to an alternate source of gas. The regulator and the loop share the same mouthpiece, and the switch connects the mouthpiece to either the loop or the regulator. With a BOV, you bail out by throwing the switch without removing the loop from your mouth, which connects the mouthpiece to the OC regulator AND seals off the loop. This is faster than bailing out from a DSV, with less of a chance of flooding the rebreather. (See Figure 2.)

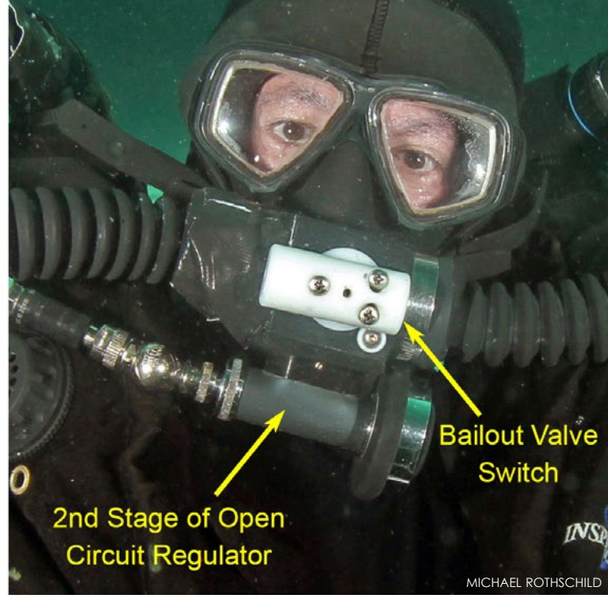


Figure 2: Dive-surface valve (DSV) vs. bailout valve (BOV)

Before the dive

The first thing to determine is if a mixed OC/CCR team is appropriate in the first place. Neither diver should feel pushed into doing this if they do not feel comfortable with the concepts outlined in this article. Yes, there are a lot of complex details to be learned that are far beyond what is required for recreational certification, but any OC diver attempting this is absolutely obligated to put in the effort to understand these basic concepts.

Figure 3: Pre-dive discussion and practice with controls

Similarly, it is NOT a good idea for a very new OC diver to be the sole buddy for a rebreather diver. Anyone diving in a mixed team needs to be very comfortable with their own diving skills and equipment.

While all buddy teams should go over plans and protocols before splashing, this discussion is especially important for a mixed OC/CCR team. Time should be allowed so that the OC diver is not rushed, and can fully understand the implications of diving with a rebreather diver. Specific details of the CCR gear being used must be reviewed.

Test run. During the pre-dive discussion, it is a good idea for the CCR diver to let the OC diver physically throw the BOV or DSV switch—these can be fairly stiff and require some effort to use. The OC diver should also try pushing the ADV or diluent MAV button, opening up the inline shutoff if present, and both inflating and deflating the CCR wing. Overpressure dump valves for both the wing and the counterlungs should be identified as well. (See Figure 3.)

Gas for emergencies. In a mixed team, there needs to be enough bailout gas to handle a wide range of emergencies, including gas sharing with the OC diver. While planning such a dive, a discussion should be had about the amount of bailout carried. While it is unlikely that both divers would need an alternate gas source, in an emergency, air consumption goes way up.

Some recreational CCR divers only carry a 40 cubic foot aluminum tank, and some gear configurations involve a single tank that provides both diluent and bailout. An aluminum 80 is a common choice for bailout to provide an extra margin of safety, especially for a team that includes OC divers.

Gas for the OC diver. So what do we do if the OC diver needs gas? Again, this is something to discuss ahead of time. Many OC divers are trained in the standard "primary donate" technique, in which the rescuing diver gives the working regulator from which they are breathing to the victim.

This is NOT done when the rescuer is on CCR.

A diver with a DSV could donate their OC bailout regulator, which might be bungeed around their neck or strapped to the bailout tank. But that is usually on a fairly short hose, and if that is the CCR diver's only OC regulator, they are then left without bailout, which is not ideal. In an emergency, with an immediate ascent and no deco obligation, this could work. But it is better to have an additional deployable regulator for this purpose.

Long-hosed regulator. One approach to this problem is to put a second regulator on a long hose on the bailout tank. When I go through my pre-dive review with an OC buddy, I show them how I would donate gas. BOV divers usually also have an OC regulator bungeed to their bailout tank, in case of a problem that affects the BOV itself (like a mouthpiece that is torn, lost or contaminated with caustic chemicals from the scrubber). (See Figure 4.)

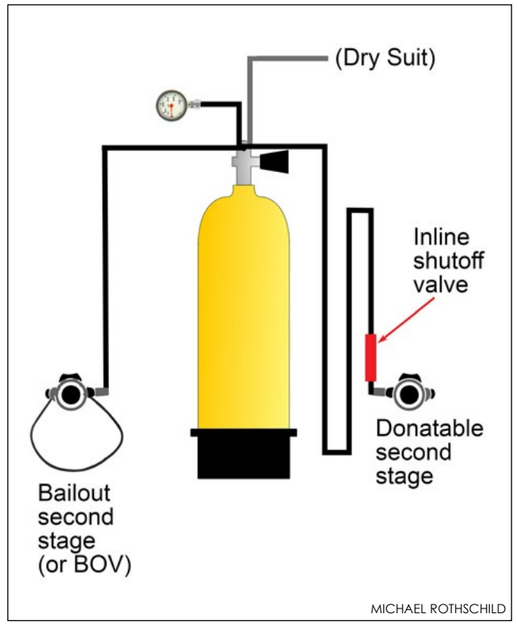
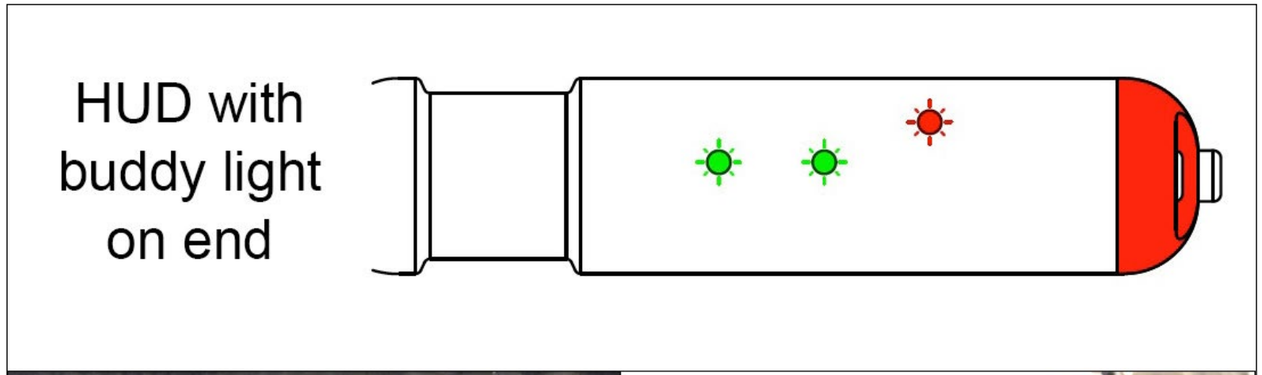
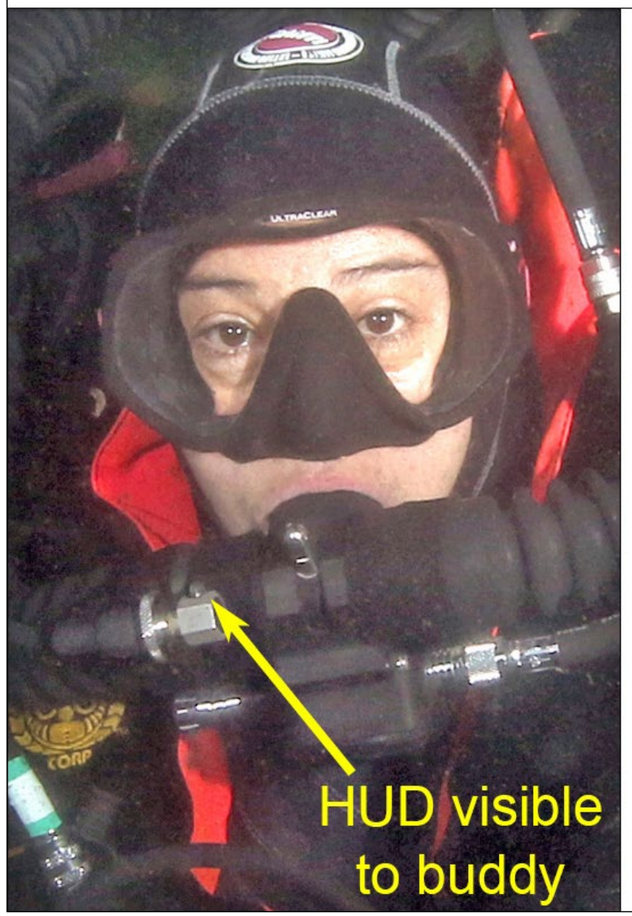
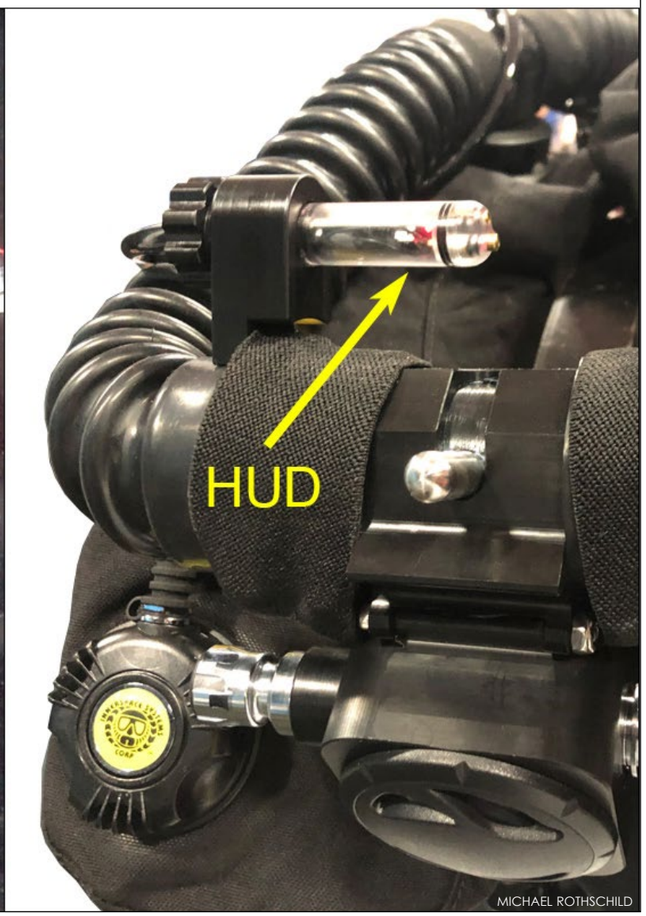


Figure 4: Open circuit bailout system

Figure 5: Heads-up display (HUD) with buddy light







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Unlike the deco bottles carried by OC tech divers, which are usually carried charged but with the valves shut off, many CCR divers leave their bailout tank valves open. The idea is that in a CO_2 emergency, your dive skills are significantly degraded, and panic with hyperventilation can make it very difficult to get off the loop. This is an advantage of the BOV, which gives you OC gas at the throw of a switch.

Ask about the switch. Because of this open valve, divers carrying an extra regulator will sometimes put an inline shutoff switch before the second stage, to prevent an unnoticed free flow with gas loss. The OC diver needs to ask if this switch is present, and to make sure that they know how to open it in an emergency.

Red alert. Ask about the significance of a flashing red light, or any other sound or visual alerts on your CCR buddy's handset or heads-up display (HUD, attached to the loop). Usually, this means that the oxygen levels are too low or too high. There have been cases where a buddy noticed this before the diver did, and called attention to it! (See Figure 5.)

Mid-dive procedures. The CCR diver should let the OC diver know about routine rebreather procedures that they may do during a dive, so that the OC diver does not think that there is an emergency or a problem. Of course, communication during the dive can help with this—the CCR diver should give the "I am OK" sign before doing anything unplanned. But it is helpful to inform the OC buddy about a potential diluent flush, O_2 flush at 20 feet on descent or ascent, and any drills (e.g. loop recovery, bailout, etc.), which might be done.

The CCR diver should let the OC diver know about routine rebreather procedures that they may do during a dive, so that the OC diver does not think that there is an emergency or a problem.

During the dive

Bubble check. If conditions permit, once both divers are in the water on the surface, a quick bubble check is a good idea. Have the CCR diver submerge the unit by leaning backwards, and look underwater for any obvious gas loss before starting the dive.

Avoid rapid descent. Rapid descents—which are fine on OC—can cause an O_2 spike on CCR, so they are avoided. If the OC diver is leading and drops rapidly in poor visibility conditions, buddy separation becomes more likely. This problem is made worse for the OC diver, since there will be no bubbles to help find a missing buddy. Descents and ascents in general require more active management on a CCR than on OC, so the OC diver should pay special attention during these times of task loading.

Check for gas leaks. CCR divers usually do a bubble check at around 20 feet, and may spend a minute or two testing their monitoring systems. Make a point of looking at your buddy's rebreather from top to bottom, and on all sides, before continuing with the dive. There are a lot of places where gas can leak (especially fittings like the ADV, MAV, main canister and first stages), and it is important to look for any bubbles again, since some leaks may not be apparent on the surface. There should be no significant gas escape on descent.

Gear check. This is also the time to look at the CCR diver's overall gear appearance. Look for excessive mobility of the rebreather or bailout tank on the diver, and look for anything hanging loose. The CCR diver may also do an oxygen flush at this point (some do it a 20 feet on ascent), to make sure that their sensors can read a high PO_2.

Constant depth vs sawtooth profile. One thing to remember is that sawtooth profiles are generally avoided by rebreather divers. This is because descents require adding gas to the loop, and ascents require venting. This wastes gas from the small reserves on a rebreather, and also requires buoyancy adjustments and extra management of the PO_2, which changes with depth. Rebreather divers tend to maintain a constant depth and swim around objects rather than over and under them when possible.

Avoid exertion. Rebreather divers also try to avoid heavy exertion, to avoid overtaxing the scrubber. While there are a number of factors that determine the scrubber's efficiency, CO_2 production is tied to the workload, and it is possible for dangerously high levels of CO_2 to build up if the diver works too hard.

Venting on ascent. During an ascent, the CCR diver will have to vent the pressure of expanding gas in the loop, so you will see bubbles. They usually come from the diver's mask, but also may come from around the mouthpiece or from an overpressure valve. This is normal.

At 90 feet, about 10 minutes into their first dive on beautiful morning with spectacular conditions, Tony tried to get Bill's attention and could not. Bill

Figure 6: Holding the mouthpiece and flushing the loop with diluent

was staring right at Tony. He seemed to be breathing normally, but he did not respond to hand signals. Tony reached out and grabbed Bill's shoulder, and he still did not respond…

In the event of emergency

An unconscious diver on OC will rarely survive, although many OC divers learn techniques to attempt rescue. The basic principles of this still apply to an unconscious CCR diver (getting the victim to the surface quickly, keeping the mouthpiece in the mouth, allowing gas to escape from the airway on ascent, etc.). However, survival may be actually more likely with CCR—one study[1] of French military rebreather divers who used a gag strap (to keep the loop in place) found that 51 of 54 divers who lost consciousness at depth surfaced successfully!

Remember that there is a difference between distracted, confused, unresponsive and unconscious. A distracted diver will respond to standard communication. A confused diver may respond to aggressive stimuli (e.g., touching or light signals directed at the mask). In some types of CCR accidents, a diver may be conscious but unresponsive—such as with a low PO_2, elevated CO_2, or after a seizure. If they are using a full face mask, a gag strap or another mouthpiece retaining device, they may well be completely unconscious but still breathing fairly normally.

The CCR diver (left) hands a second stage to the OC diver (right).

Insert OC regulator. If the unresponsive diver has the loop out of their mouth, the first thing to do would be to attempt to insert an OC regulator (yours or theirs).

Prevent flooding. The other thing that is vital to do immediately is to close the DSV or turn the BOV to OC mode. Although the rebreather may be partially or completely flooded at this point from water entering through the mouthpiece, closing the loop will prevent it from flooding more than it already has. A flooded rebreather will be very negatively buoyant and making rescue much more difficult. Of course, in this situation the chance of a successful rescue is small.

Hold loop in mouth. If the loop is in place, keep it in the diver's mouth. If a BOV is present, throw the switch to the OC position, and bubbles should appear if the diver is breathing. If a BOV is not present, keep the loop in the diver's mouth, but NEVER throw the DSV switch (remember, the DSV seals off the loop and the diver will not be able to breathe).

Diluent flush. You can flush the loop with diluent in this situation, using the ADV or diluent MAV. If you do this, be prepared for increased buoyancy, and vent through the overpressure valve. The specifics of this are very important, and should be discussed ahead of time, but remember that you should NEVER throw the switch on a DSV while the loop is in the diver's mouth, and you should NEVER flush with O_2. (Figure 6.)

Seizure. One catastrophic consequence of excessive oxygen exposure is a seizure. It is not the seizure itself that is dangerous, but the loss of the loop with unconsciousness. A standard recommendation is to hold the loop in the victim's mouth and wait until the "clonic phase" of the seizure (shaking) has stopped before ascent. This is for two reasons. First, it would be much harder to manipulate a diver during a seizure. Second, during a seizure the airway may be closed, putting the diver at risk for severe pulmonary barotrauma on ascent.

Lifting. Lifting an unconscious rebreather diver is particularly challenging, because of the increased possibility of runaway ascent due to expanding gas in multiple closed spaces. Also, it may be hard for the rescuer to position themselves behind a bulky rebreather so as to hold the loop and manipulate the inflator hose at the same time. Being slightly above the victim (behind the diver's head instead of directly behind their back) may be helpful.

Venting gas. In addition to venting gas from your own wing and the victim's wing (as well as both drysuits, if used), you will also need to vent gas from the victim's CCR loop. If a BOV is being used, remember that even though they may be breathing, the loop is now sealed off and will not vent through the mouthpiece. The overpressure valves can help, but be aware of this issue.

Avoid runaway ascent. The way to avoid a runaway ascent is to be proac-

tive with venting by pulling the dump cord (if present) or BRIEFLY opening and then closing the DSV if it is out of the diver's mouth, with the mouthpiece held above your head. To make buoyancy matters worse, as you ascend, many CCRs will try to maintain the dropping PO_2 by injecting oxygen into the loop. A rebreather diver ascending on OC will set the rebreather to "low setpoint" and/or shut off the O_2 valve to make this less of a problem. If you are rescuing a CCR diver who is on an OC regulator (loop out or BOV), the O_2 valve should be closed for this reason.

Do not wait to dump gas until the runaway ascent has already started, with you trying to manage five different gas filled spaces simultaneously! Completely empty your wing and use the victim's wing for buoyancy on ascent if needed (especially if the CCR has flooded). That way, if you lose your grip, the victim will at least surface.

Positive buoyancy. Once on the surface, achieve positive buoyancy by inflating the wing, remove the loop and keep the victim's mouth above the surface. You MUST remember at this point to close the DSV or switch the BOV to OC if it is not already in that position. If this is left open after removal from the victim's mouth, the CCR can flood and become negatively buoyant, and the victim may sink even with gas in the wing.

ALICE CHONG

Communication between members of a mixed team of OC/CCR divers is very important.

Medical evacuation. After reaching the surface, rescue is similar to that taught elsewhere. If the boat is immediately available, get the diver out of the water right away and activate the medical evacuation system. If a surface swim or pickup is needed, the rescuer should remove their own gear first and give rescue breaths while transporting the victim.

Tony realized that Bill was conscious and breathing but unresponsive. He remembered how Bill had gone over this possibility in their pre-dive discussions, and he knew just what to do. While he was not sure what exactly was wrong with the gas in the loop, he knew that Bill needed fresh gas of a known and safe mix right away. Holding the loop firmly in place, he switched the bailout valve and bubbles started flowing from the vent. Bill soon began to respond to hand signals, and they made a safe ascent together. On the surface, it became apparent that the CCR solenoid had failed, and that Bill had not noticed the dropping PPO_2 levels.

Summary and checklist

I hope that this article will help all members of a mixed OC/CCR team think about the discussions that should happen before getting in the water. I also hope that this basic introduction to rebreathers, while brief and superficial, will be enough to let a reasonably experienced and committed OC diver understand why these special techniques and protocols are necessary.

I do not mean to scare people away from doing this, but each diver must realize that they are obligated to go beyond the standard diver buddy arrangements that they may have had in the past.

Here are a few basic questions that an OC diver should go over with a CCR buddy before the dive, in the form of a checklist. Remember, good communication is crucial for all dive buddies, but particularly in mixed OC/CCR teams.

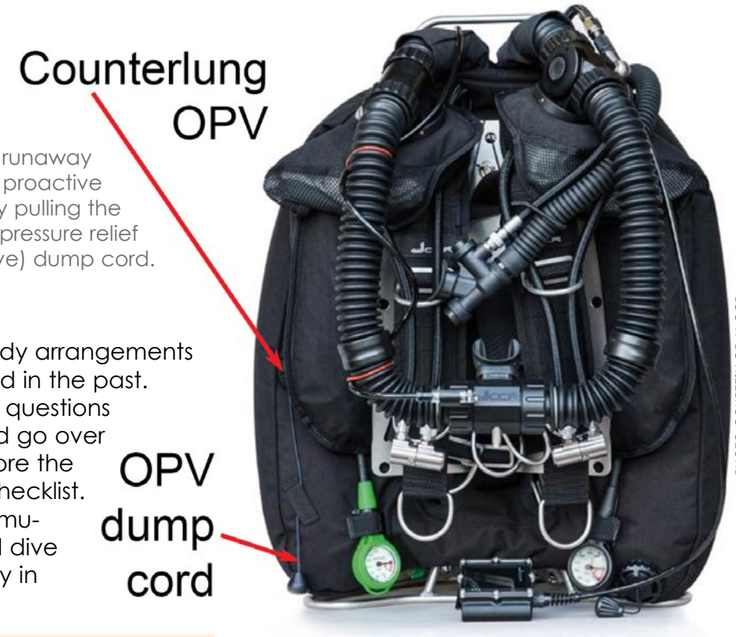

PHOTO COURTESY OF JJ-CCR

1) What is your bailout configuration, dive-surface valve (DSV) or bailout valve (BOV)?

2) What would you like me to do if I find you truly unresponsive but with the loop in your mouth? If the answer is switch the BOV, then can I try doing that now?

3) Are there any depth considerations for your bailout gas(es) or diluent that I should know about?

4) Do you have an open circuit regulator that you could donate to me in case I have a catastrophic gas loss?

5) Where is your ADV or diluent manual addition valve (MAV)? Under what circumstances would you want me to push either of those buttons? Can I try doing that now?

6) Where is your wing inflator and dump valve?

7) Where would I look for high or low PO_2 alerts on your heads-up display (HUD) or controller?

8) Is there anything that I should never touch or do? ■

*Michael Rothschild is a pediatric otolaryngologist (**kidsent.com**) in New York City and a technical rebreather diver. He has served as president and dive chair of the New York City Sea Gypsies (**seagypsies.nyc**), and as a medical moderator on Scubaboard.com. Although he certainly enjoys the warm, clear water of the tropics, he especially loves local diving and does his best to encourage other divers to visit the vibrant marine ecosystem and historic shipwrecks right off the New York/New Jersey coast. He is an avid underwater photographer and videographer, and is currently the co-director of the New York Underwater Photographic Society (**seagypsies.nyc/imaging**). In this capacity, he organizes and teaches the annual NYUPS underwater photography workshop at Dutch Springs, Pennsylvania, and runs the monthly NYUPS meetings with his colleagues.*

REFERENCES:

[1] GEMPP, LOUGE, BLATTEAU, HUGON. DESCRIPTIVE EPIDEMIOLOGY OF 153 DIVING INJURIES WITH REBREATHERS AMONG FRENCH MILITARY DIVERS FROM 1979 TO 2009. *MILITARY MEDICINE*, 176, 4:446, 2011

Dray van Beeck

P O R T F O L I O

portfolio

Cave, by Dray van Beeck. Digital art, 26 x 43cm (left). PREVIOUS PAGE: *Atlantis Found*, by Dray van Beeck. Digital art, 57 x 80cm

Dray van Beeck

City, by Dray van Beeck. Digital art, 127 x 90cm

In this issue, we celebrate Dutch digital artist and dive professional Dray van Beeck, who passed away suddenly on 19 April 2021. Together with his wife, Karin, he managed the Bali Diving Academy Pemuteran in Indonesia. A fine artist, avid diver and underwater photographer, Dray created surreal and fantastical scenes in digital artworks composed using his own underwater images. A few months ago, *X-Ray Mag* interviewed the artist and we share with you now the artist's own words about his creative process and insights on digital art and the underwater realm he loved.

Text edited by G. Symes
All digital art by Dray van Beeck

X-RAY MAG: Tell us about yourself, your background and how you became an artist.

DVB: I studied art at the Royal Art Academy in Den Bosch in the Netherlands. Afterwards, I taught art for 12 years until I decided to change my life and become a dive instructor. In 2001, my captain found a digital underwater camera. I bought it off him and soon had a new passion: underwater photography.

Through cleaning up photos, I soon became engrossed in manipulating images. The work *Victory Round* on page 21 of my book *Kreations* shows the things I did at that time. I bought a book to learn Adobe Photoshop. However, this went too slow, and I let it go, experimenting and doing things completely wrong and complicated.

The best moment in my digital career was when a guest who saw me working asked why I did not use layers. A world opened up. I recommend to anyone who wants to start using a manipulation program to watch tutorials. It really helps. However, I learned a lot from my trials and mistakes.

X-RAY MAG: Why marine life and underwater themes? How did you come to these themes and how did you develop your surreal style of digital art?

DVB: As I said in the previous question, I started with underwater photography. Because I used the built-in flash, there was a lot of reflection from particles in the water. To remove these, I used Photoshop, adjusting the colors and contrast. Previously, my main style of art was

NudiMania I, II and *III,* by Dray van Beeck. Digital art, 118 x 118cm each

Homage to Dali, by Dray van Beeck. Digital art, 35 x 49cm

abstract expressionism. But this was not a style I could use with underwater themes. When I was young, I loved the work of Dali, Escher and Willink. Now these were styles that befitted my ideas of manipulations.

X-RAY MAG: Who or what has inspired you and your artwork and why?

DVB: When it comes to manipulations, I was not really influenced by any one person, since it just sort of happened. When it comes to a style of art, I guess I am mostly inspired by Dali. But my brain is in constant motion and just doing what feels right seems to work. In the end, there is not one style but many, depending on the mood and the day.

X-RAY MAG: What is your artistic method or creative process?

DVB: Sometimes, like with the *NudiMania* series, I have the idea before I start. I think about it for a couple of hours in bed, and then I just have to copy this to my computer the next day. Another way to go is just sitting with my laptop

The Last Supper, by Dray van Beeck. Digital art, 23 x 35cm

TOP LEFT TO RIGHT: *Parrotfish*, 44 x 59cm; *Boxfish*, 45 x 30cm; and *Mohawk Frog Fish*, 38 x 52cm, from the *Hybrids* digital art series by Dray van Beeck

Spanish Dancer, 43 x 65cm, from the *Hybrids* digital art series by Dray van Beeck

and starting with a blank page—cutting out a photo and letting it grow into a work. This works 50 percent of the time. It is more organic and very rewarding when it comes out right. The most satisfying works come from making a series. The *Hybrids* series from last year was extremely satisfying (see: **aqualifephotos.com/hybrids**).

X-RAY MAG: What is your relationship to the underwater world and coral reefs? How have your experiences underwater influenced your art? In your relationship with reefs and the sea, where have you had your favorite experiences?

DVB: My digital art started with using my underwater photos. Afterwards, I alternated with other themes, but the underwater world was a main theme making up for more than 50 percent of my work. After 8,000 logged dives, I think I can say that a great part of my adult life was in, on and under the water. I love it. It's peaceful, beautiful and can fulfill you with the smallest things.

Through the years, I got more and more interested in the macro world, but two of my most memorable experiences were with bigger animals. A dugong swam with me for five minutes in Egypt, wondering what I was doing. Another time, a tiger shark looked too big through my camera lens. It was a fisheye lens I was using for the first time. The four-meter shark was just 5cm from the lens. My wife almost drowned from laughing so hard.

Catfish, 37 x 25cm, from the *Hybrids* digital art series by Dray van Beeck

portfolio

Full Moon at the Blue Hole III, by Dray van Beeck. Digital art, 106 x106cm

Dray van Beeck

X-RAY MAG: What are your thoughts on ocean conservation and coral reef management and how does your artwork relate to these issues?

DVB: As a dive instructor, a lot of time nowadays goes into conservation of the sea. We do regular reef and beach clean-ups here in Bali. When I start an underwater photography workshop, I let the students first practice good buoyancy in the pool. I have seen too many photographers destroying parts of a reef to get the right photo. This should be not be encouraged. Manipulating a photo in the water is wrong. Moving shrimps around so they are in a nice position should not be tolerated. This is the main reason I gave up on underwater photography contests. Nowadays, I only enter in "manipulated" categories.

X-RAY MAG: What is the message or experience you want viewers of your artwork to have or understand?

DVB: The sky is (not) the limit…

X-RAY MAG: What are the challenges or benefits of being an artist in the world today? Any thoughts or advice for aspiring artists in ocean arts?

DVB: When I was young, it was hard to find a place in the art world. I was a painter. At that time, it was more about public relations than about one's artwork. Nowadays, it is even harder. Digital photography is the norm, and image-editing programs are getting easier and easier to use. Luckily, there is also creativity involved. But if you have a good idea, go for it! Experiment. Do not be afraid

Full Moon at the Blue Hole IV, by Dray van Beeck. Digital art, 86 x 63cm

Iceberg, by Dray van Beeck. Digital art, 88 x 35cm

Tropical Island, by Dray van Beeck. Digital art, 64 x 46cm

Fish Portraits, by Dray van Beeck. Digital art, 43 x 80cm (above); *Extinction VII*, by Dray van Beeck. Digital art, 50 x 55cm (right)

of doing something wrong. But use "Save As" on your works many times, since you will probably go too far with your editing and want to go back to an earlier version. Look at the total work [as a whole], in the beginning. Then, when it looks good, zoom in and work on the details.

X-RAY MAG: Lastly, is there anything else you would like to tell our readers about yourself and your artwork?

DVB: I love making my art, and I love it when my artwork evokes a reaction in people. I am so happy I found a way to combine my two passions: diving and art. If you are interested in underwater photography, and the rest of my artwork, please come and visit: **aqualifephotos.com**. ■

*For more information or to order prints, please visit the artist's webshop at: **aqualifephotos.com/shop**, or follow at: **facebook.com/dray.vanbeeck** or **instagram.com/aqualife_photos**.*