



Text and underwater photos by Andrey Bizyukin. Topside photos of diving birds by Nataliya Chervyakova. Edited by Gunild Symes

All along the shores of the Kola Peninsula in North Russia, Finno-Ugric tribes (Laplander) have lived since the oldest of ages. In the 11th century, the Viking ships appeared here, and then the Novgorods and the Pomors (Russian settlers and traders on the coasts of the White Sea and the Barents Sea) came. All of them adapted successfully to this severe place, went to the sea to catch animals and fish and to trade their goods. They even drew sea charts. This went on until 1594, a year when a secret Dutch expedition, under the leadership of Captain Willem Barentsz, appeared in this place. **Their purpose was to find a northeastern sea pass to Asia and China.**

During their three years here, the Dutchman organized three expeditions to search for a navigable way through the ice. They discovered new lands,

charted maps, made meteorological observations, and conducted the first wintering of the Dutch team in the Arctic region. They struggled with scurvy, having lost their ship, and made a desperate attempt to get to safety on two cockboats to reach the Kola Peninsula

where they met the ship, *поморов*. The surviving crew members came back to Amsterdam where they had long been considered dead.

The history of these navigations are described in books by Gerrit de-Fera, *The truthful description of three voyages by*

the Dutch and Zealand ships, to the North from Norway, Moskovia and Tataria, to kingdoms China and Cinchona, and Barents's voyages (Diarium nauticum).

During the last expedition, Willem Barents died of scurvy. According to seamen tradition, he was buried in the

sea, which the German geographer, A. Peterman, named the Barents Sea in 1853 in honor of this famous polar explorer.

Diving in Russia?

In discussing the best dive sites of the world with foreign journalists—the elite of



The Barents Sea



does one find authoritative experts, photographers and dive guides from the best diving locations in Russia, to describe all the unique features and beauty of the underwater world of this country?

In the midst of these infinite meditations, we were interrupted by the unexpected offer to dive on the Barents Sea to the north of the Kola Peninsula in the territory of the

Kandalaksha nature reserve. If one has a look on a map, it is to the east of Norway and even further to

the east of the city of Murmansk.

The offer looked routine and not promising of anything especially new. We knew practically nothing about the diving features in this region, but all the same, decided to go, in order to start to build up a personal collection of details on Russian dive sites for our foreign friends.

We had already dived in Norway, and as the north of the Kola Peninsula is a continuation of the Norwegian coast, which is already known as a classic in the best cold water dive sites of the world,

we expected to see an underwater world very similar to the Viking country. It was also interesting to us to have an opportunity to compare diving in the Barents Sea to that of the Norwegian Sea.

The northern coast of the Kola Peninsula, or southern edge of the Arctic Ocean, is straighter than the rest. Here, there are very few warm fjords and only a few good bays. That's why the influence of the Arctic Ocean is felt so very much up here, and strong storms happen quite often.

There are three natural landscapes one passes during the four hours of driving from the airport of Murmansk to the region, and 70 kilometers of broken roads up to the fishing settlement of Teriberka where we would be boarding our dive boat. The coniferous and mixed woods came to an end as soon as we crossed the snowy hills, and the forest tundra with rare bush from Karelian birch, thawed streams and snow fields, began.

Nearing the coast at the Arctic Ocean, even dwarfish trees disappear. Here,

the international diving press—we found out with surprise that our writer/diver friends knew practically nothing about diving in Russia.

From year to year, such erudite divers of most other countries asked us the same questions: Where is it interesting to dive in your country? Where are the best dive locations, etc.?

Certainly, Russia is the country of 13 seas, but how do you talk about all the diving attractions in each of them? Where



THIS PAGE: The north coast of the Kola Peninsula is a rocky ice desert with dwarf plants contrasting with the sea which is filled with life





people still live here. They are fishermen, hunters, biologists, military, coast guard, and those who have no where else to move to from here.

In the near future, there may be a new terminal of "Gazprom" constructed here. People hope to find new jobs and maybe a new life will return to these wild territories.

Diving

We boarded a surprisingly comfortable and specialized dive boat,

at the surface. With depth, it fell to 3-4°C.

The first dive is comparable to falling into liquid nitrogen, with the freezing temperature sharply burning unprotected areas of the face. Time vanishes. Then, the body rebuilds on calorification, and the water doesn't seem so cold any more.

For extra safety, all the divers in our team dived with two valve cylinders and duplicate regulators in case of freezing. At the surface, we met a layer of muddy fresh water. At three meters, we crossed the hallocline and came into an ice cold zone of Arctic water with 30 meters visibility.

This was a world of seaweed kelps, fishes, starfishes, hedgehogs, crabs, mollusks, actinium and soft corals. All of them look so active, occupied with such important business, well fed and happy with their lives.

In the first 40 minutes of making an acquaintance with the underwater world of the Barents Sea, one gasps with astonishment. We were amazed and inspired by



Ice burning water, great visibility, kelp jungles, sea-urchins, small crabs and incredible multicolor sea anemones—and this is just in the first dive!

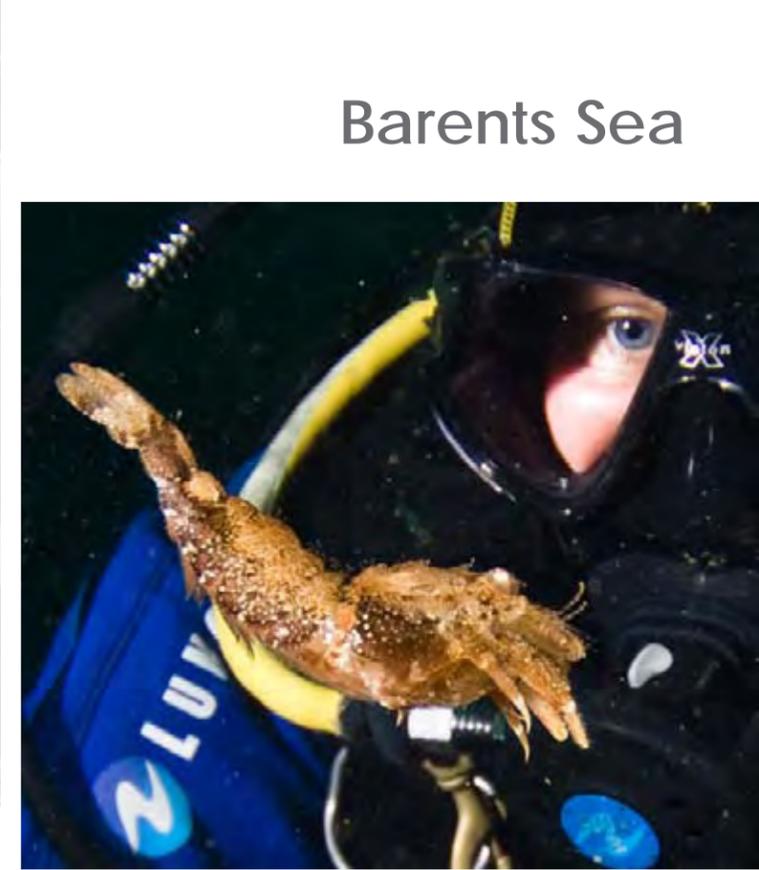
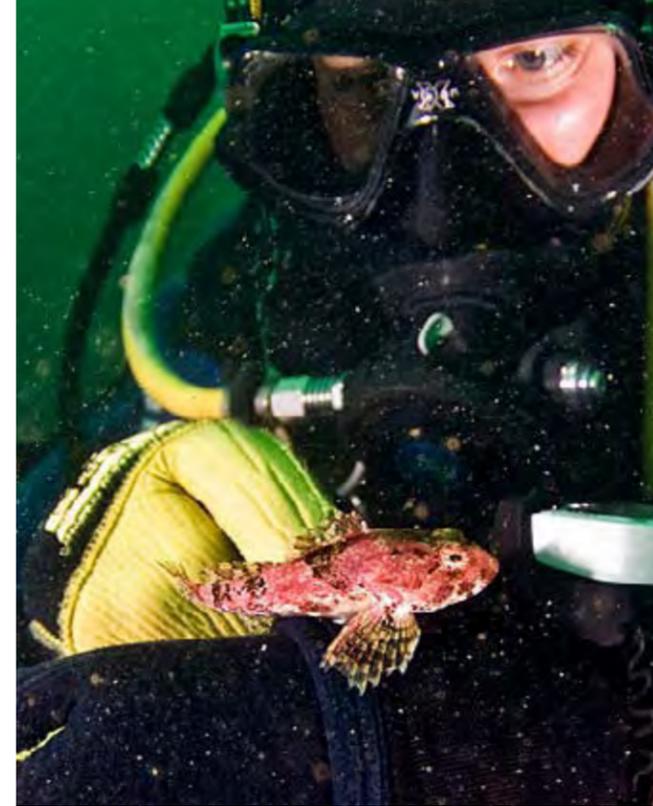
it's a tundra kingdom. Frequent Arctic winds, with mid-annual speeds of nine meters per second sweep away all that is in the way. Only lichens, reindeer moss, black crowberry and herds of reindeers survive.

Today, this is the deserted territory of a collective of fishing villages still exhibiting the era of communist construction—empty houses, beaten out glass, ruins—a zone of alienation like a scene from a science fiction novel. It seems surprising, that some

a vessel with the unique name, *Kartesh*, and headed to the Barents Sea. The heavy lead color of the water, long oceanic waves, naked stone rocks on the coast, even a midnight with no coming sun and infinite polar day, greeted us. "If it is so deserted on the surface, what then should we expect to see under the water?" was the first crazy thought that popped into my head.

Noisy seagulls circled around us and the first curious seals kept far off from the dive boat, when we prepared for our first dive into the Dolgaia Guba Bay. The water temperature was eight degrees





what we saw, and came back to the surface impressed with the wondrous biodiversity of the underwater life, so contrasting with the lifeless ice desert at the surface.

We came aboard the boat with questions for our dive guides and sea biologists. Why was the water here greenish in color, and the majority of fish consumed by humankind (thousands of tons) caught here? It appeared, that freezing under ice during the long polar winter, the ocean became heavier and squeezed out to the surface, benthonic water—water that is saturated by a lot of organic material, which is made up of all kinds of animal substances useful and necessary for life).

The vertical convectional currents found here create the necessary

conditions for rapid growth of microscopic seaweed and krill. As a consequence of this, the sea becomes a never-ending source of food for fishes, birds, seals and many other sea animals.

Not so many divers know that the seaweed of the northern seas is one of the largest manufacturers of atmospheric oxygen. There is an authoritative scientific opinion that suggests that it is precisely these seaweeds of the cold water in the northern seas that make more oxygen than all the planet's forests taken together, providing the major reason for the survival and existence of humans on land, which is so small in comparison with the area of the global oceans. Overwhelmed by such important scientific information, we understood that we

were diving in a place absolutely unique in the world.

Dalnie Zelentchy Bay

Thirty sea miles even further to the east though ocean waves, along coastal rocks laden with snow, we stopped to anchor in Dalnie Zelentchy Bay. This is an historical place for Kamchatka (King) crab expansion into the Barents Sea and Norway. It is precisely from this place that its biological experiment was begun.

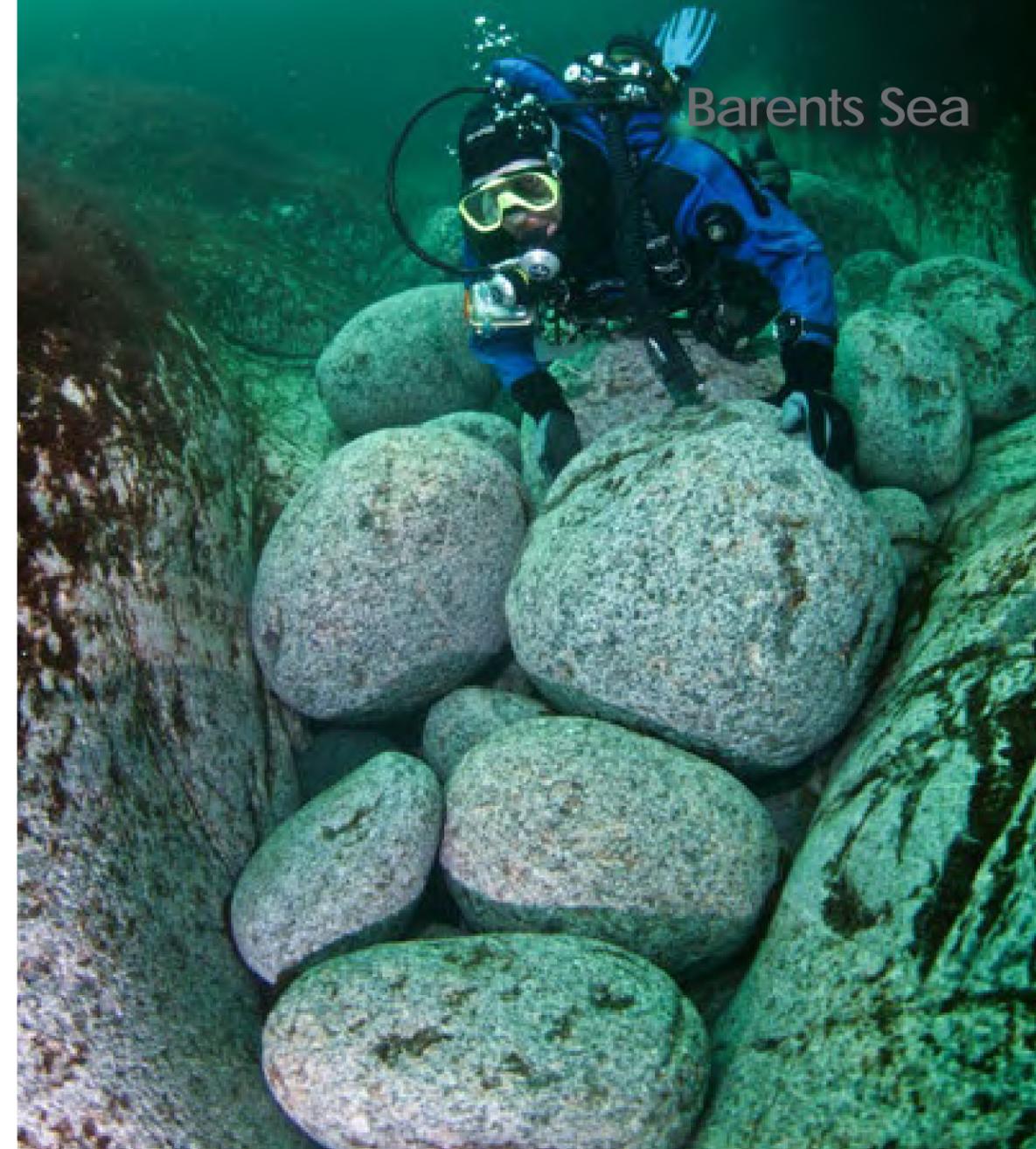
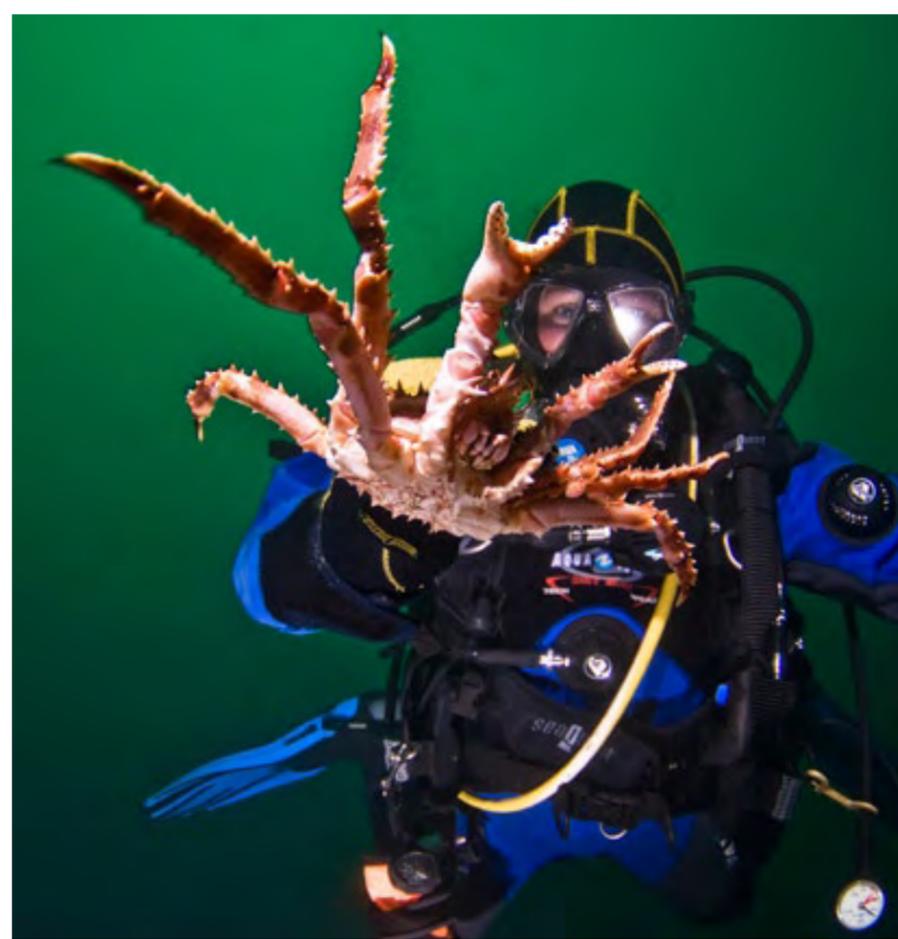
During the 1960s, the Soviet Union scientists experimented with crabs. Thousands of Kamchatka crabs were brought here from the Far East, from year to year, and were issued into this bay of the Barents Sea.

But no matter what the biologists



The Barents Sea is full of small and big creatures (crabs, ruff, prawns, lumpfish, comb jellies) who are all hungry and ready to hunt all day and into the night. An even more amazing underwater flower (a sea anemone that on first look, appears so passive) catches a jellyfish by its rays and draws it into its gluttonous mouth





Barents Sea



did, the crabs completely disappeared into the bottomless sea. It seemed to the scientists that the crabs were not able to survive here. The arrogant scientific project was officially deemed a failure, and was tossed.

The sea laboratory of Murmansk Sea Biological Institute was established in Dalnie Zelentchy Bay. Of the many scientific projects realized in this laboratory, the most astounding one was the success of settling Kamchatka crabs in the Barents Sea.

The Kamchatka crab lives almost 30 years,

Kamchatka King crabs integrated very well in the biocenose of the Barents Sea. TOP LEFT: Small crabs like to be together (especially during moulting time) for better protection from big cods and other predators

and it gets big enough in size suitable for industrial catching only after it reaches 15 years of age. This is the reason why some malicious gossip suggests that just the right amount of time has passed for the first crabs that were started here 30 years ago to have multiplied just enough to be caught now.

Today, the famous historic sea research institute is totally abandoned. Everything was destroyed after Perestroika. Now there is only a private farm for growing the crabs in natural sea conditions.

With great interest, we dived this historical place and explored the various underwater landscapes.

A huge seal-hare, or bearded seal, with a wonderful gray-haired moustache and big dark eyes, slowly floated around us. Inquisitiveness motivates these animals. He made a few circles around us, studying us, these strange fin-footed

carnivorous relatives. But when I attempted to come closer to him to take a close up photograph, the seal moved farther away from us odd fellows, as he was blinded by flashlights from the strobes.

It was an underwater jungle at this site, from finger kelps, developing tidal currents, Kamchatka crabs, delicious scallops, curious seals, underwater canyons, steep walls, grottoes and the picturesque rocks densely covered in hundreds of multi-colored predatory actinium, pleasing our senses from dive to dive.

The following evening transfer took us even further east where we dived around several islands: Anonymous, German, Inhabited and Krechetov. Huge blocks of rock were covered with seaweed taller than a human. There were heaps of rock fragments, grottoes and tunnels, masses of sea





Attractive and exciting underwater landscapes and great biodiversity awaits every diver

hedgehogs and sea stars, rare fishes and, as always, great visibility with temperatures at 4.5 - 5°C.

We still can't deny our first impression, that the Barents Sea is considerably more filled with a life than even the Norwegian fjords. Here, the water is more clear, and there are more animals and underwater beauties.

Following is a list of just a few of the local animals that would be interesting for underwater photographers: crab-spider, King crab, cancer-hermit, skeleton shrimp, hairy hermit, Eulaus shrimp, sculptured shrimp, Acorn barnacles, sea

spider, trumpeter, scallops and more than five kinds nudibranches, mollusks, star fishes, sea cucumbers, hedgehogs and carnations, catfish, lumpfish, (Pholis) gunnel, sea scorpion, cod, herring, whales and seals.

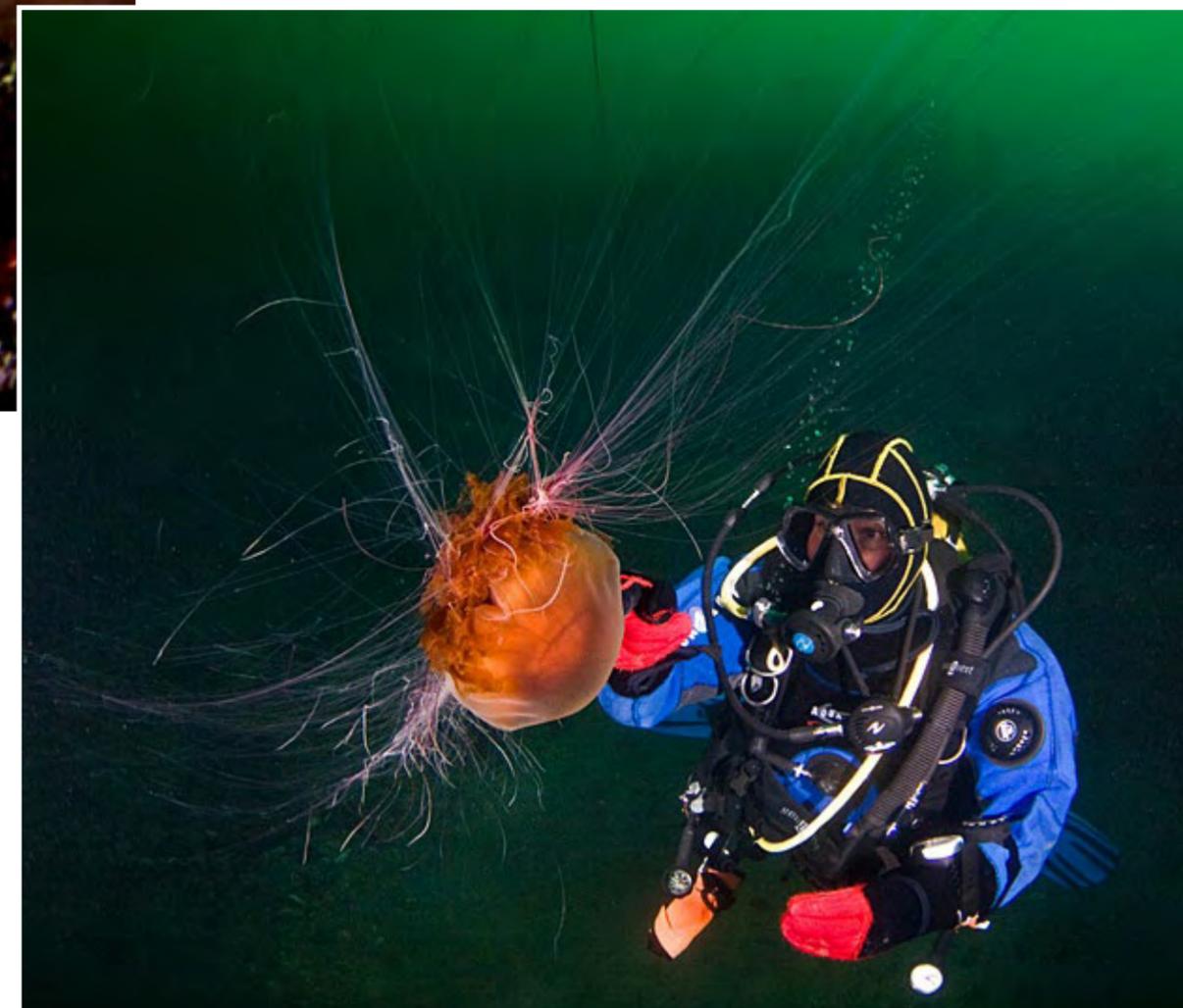
The most distant and amazing dive site was off the island of Kuvshin (or 'Jug') in the archipelago of Semiosrov'e. The island is a nature reserve for birds. Guillemots, unique birds that can fly under the sea, nest here.

We dived directly under the steep rocks hosting a noisy bird market. We submerged to a depth of 15m and met

a jungle of finger kelps. Huge king crabs walked between the stones. One of the crabs, having torn off an arm of a starfish, was busy devouring it, savouring it with pleasure.

We moved along rocks and looked upwards to the surface of the water from time to time. We were waiting for the guillemots to start diving. It could happen at any moment.

Two kinds of guillemots nested here. One of them likes to search the sea bottom for sandhoppers and can dive to 30 meters depth. The other hunts for small fishes in the open water.





We hoped that guillemots would become interested in us, the unusual fin-footed creatures, and come dive with us. We continued to wait for them underwater, but we ran out of air, and we realized that our attempt was in vain. The guillemots wouldn't come dive with us.

Then we decided to use a second method: after submerging underwater, we fixed ourselves to three-meter long ropes that were attached to an inflatable rubber boat, and then drifted along with the boat, which made its way along the birds' market place.

We hoped that the birds would get used to us, cease to be afraid and pose for our cameras nevertheless. Our persistence and patience paid off after 20 minutes of drifting with the boat, the flying birds suddenly appeared in the depths of the cold green water. It was surprising that they literally flew under the water, rowing intensely with their wings, and swiveling their heads to examine us.

One of them made a circle around us, and after inspecting us, disappeared somewhere in the depths of the ocean filled with plankton. But in a minute, new individuals, who probably found out about us funny creatures drifting

under the boat from the first envoy, flew into the sea to meet us. They also turned around, swiveling their heads and peering at us.

Guillemots are birds with black backs, wings and white breasts. Underwater, they look completely made of silver. Their bodies are covered with little air bubbles protecting their feathers from getting wet.

The show was amazing! The world had turned upside down. Birds flew not across the land, but underwater, and in the Barents Sea in Russia of all places! Our curiosity in the birds became even more intense after seeing them in action, especially with the knowledge that there is uncertainty in their survival.

We finished our diving adventure by visiting one of the noisy bird markets on the island of Harlov. Thousands of sea birds arrive here during this time of year, in this lifeless ice desert, to lay their eggs and raise their young. Yet, it is here that there is a surprising sea filled with food for the

hungry birds. The trip to the Barents Sea and the discovery of the magical underwater world of the Russian North made an indelible impression upon us all. We can now make an authoritative recommendation for these places to our friends and divers worldwide. It is typical of Russian diving, where adventures leave only delightful emotions and memories—perks of experiencing the life-filled cold water seas of our country. ■

Special thanks to Nataliya Chervyakova and Mikhail Safonov, highly educated marine biologists, who showed us the unique underwater world of the Barents Sea.

THIS PAGE: There is a lot of food here, if you know how and where to get it. Hence, millions of birds come here to lay their eggs and raise their babies each spring and summer

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POINT & CLICK
ON BOLD LINKS



Equipment *Die hard*



Edited by
Arnold Weisz



IQ Rayboard

With the iQ-Ray-Board you can glide smoothly through the underwater world. Pulled by a boat on a rope, you only need to tilt the Ray-Board slightly to plunge under water. Beginners can easily cruise through the underwater world while advanced Ray-Boarders can experiment with speed and waves. Prototypes of the Ray-Board are being presented at trade shows around the world, while production will start in February. The Ray-Board will be available for sale from iQ-Company in May 2009.

www.iq-company.com/ray-board



Uemis Zurich Scuba Diver Assistant

This Swiss made diving computer features a high definition display in all lighting conditions. The Uemis Zurich can be recharged via the integrated solar module, USB cable connected to your laptop, or using the Uemis travel charger plugged into a power outlet. Other features also include three slide controls and 5-way navigation for easy use above and under water, even while wearing gloves; 5-way navigation with three non-slip slide controls; intuitive menu control; entry of text and numbers via virtual keyboard and a tank pressure transmitter. www.uemis.com

Scubapro A700

The MK25 and MK17 first stages have both been redesigned in polished chrome finish editions, specifically for the new A700. Some of the features of the A700 second stage: polished chrome exterior, compact dimensions for lightweight comfort, air balanced valve technology, new aligned VIVA system with co-axial 2-piece dive switch, full metal body and metal components assure maximum performance and quality. Metal provides the thermal exchange in the second stage, lowering the possibility of freezing in cold water. www.scubapro.com

Vyper Air

The Suunto Vyper Air includes Air, Nitrox and Gauge modes with the ability to switch gases during a dive. It features optional wireless air integration and a technologically advanced electronic 3D compass that tilts up to 45 degrees in any direction. With the new wireless air integration option, the Suunto Vyper Air allows divers to monitor tank pressure and air consumption conveniently from their wrists. In Nitrox mode, divers have the choice of using two different gas mixes, which are pre-set before the dive. During the dive, divers can then switch to the second gas if they are within the maximum operating depth. Other features: built-in dive simulator, multi-step ascent rate indicator, automatic safety stop countdown and optional USB-compatible PC interface. www.suunto.com

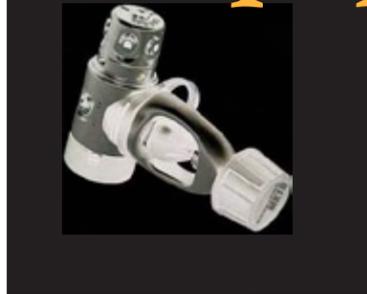


Bonex Discovery

This German made scooter weighs 24 kg including battery and trim. It has a run time of 280-400 min. Other features: up to 18km range, two independent LiMn batteries that direct switch selection, emergency switch, sealed motor, neutral buoyancy at any depth, step less speed setting, one-handed operation, carbon hull and a carbon propeller shroud. www.bonex-systeme.de



equipment



Onyx M1

The Hollis Gear Onyx M1 is a low-volume frameless mask with a skirt made from 100% silicone. Ideal for a backup mask, it can be folded away and retrieved quickly in an emergency, as well as being low volume and wide vision! The mask has a crystal clear view thanks to the use of Saint-Gobain Diamant glass which improves the transmission of light

www.hollisgear.com

AquaLung Titan LX Supreme 2009

This regulator comes with the following features: auto-closure device (ACD) keeps corrosive water out of the first stage, a pneumatically-balanced second stage, T-shaped first stage to optimize the location of the 4 MP ports and 1 HP port, yoke (3300 psi / 232 bar max) or DIN (4350 psi / 300 bar max), easy-to-grip venturi lever prevents unwanted free flow at the surface while giving a performance boost at depth. The regulator is compatible with nitrox, up to 40% O₂, new out of the box. It is also equipped with Aqua Lung's patented Comfobite mouthpiece along with a reusable mouthpiece clamp. The Titan LX Supreme is resistant to freezing when diving in waters colder than 50°F / 10°C.

www.aqualung.com



Magnetic

Oceanic introduces the perfect combination of magnetic attraction and accessibility with the highly-anticipated Octo Swiv with Magnetic Keeper. This innovative octo exhibits improved convenience through an extraordinarily easy-to-attach magnetic keeper. No more pinch clips. No more Velcro. No more fumbling. An inline swivel allows for adaptability and flexibility in situations that require immediate accessibility and safety. This low profile octo has no downside, literally. The Octo Swiv with Magnetic Keeper can be used in ANY position you desire restoring a level of safety to any out-of-air situation.

Oceanicworldwide.com

Cobra 3

The Suunto Cobra3 is a full-featured decompression dive computer console with air integration capabilities. It has the ability to monitor and display air pressure, track the rate of air consumption and continuously calculate the remaining air time. It also features a new electronic 3D compass and easy-to-read matrix display with simplified four-button operation. The electronic 3D compass offers divers the unique ability to tilt the compass up to 45 degrees in any direction without impairing the ability to read figures clearly and accurately. Additional functions include 42-hour logbook and profile memory, optional USB-compatible PC interface, and extended decompression range. www.suunto.com

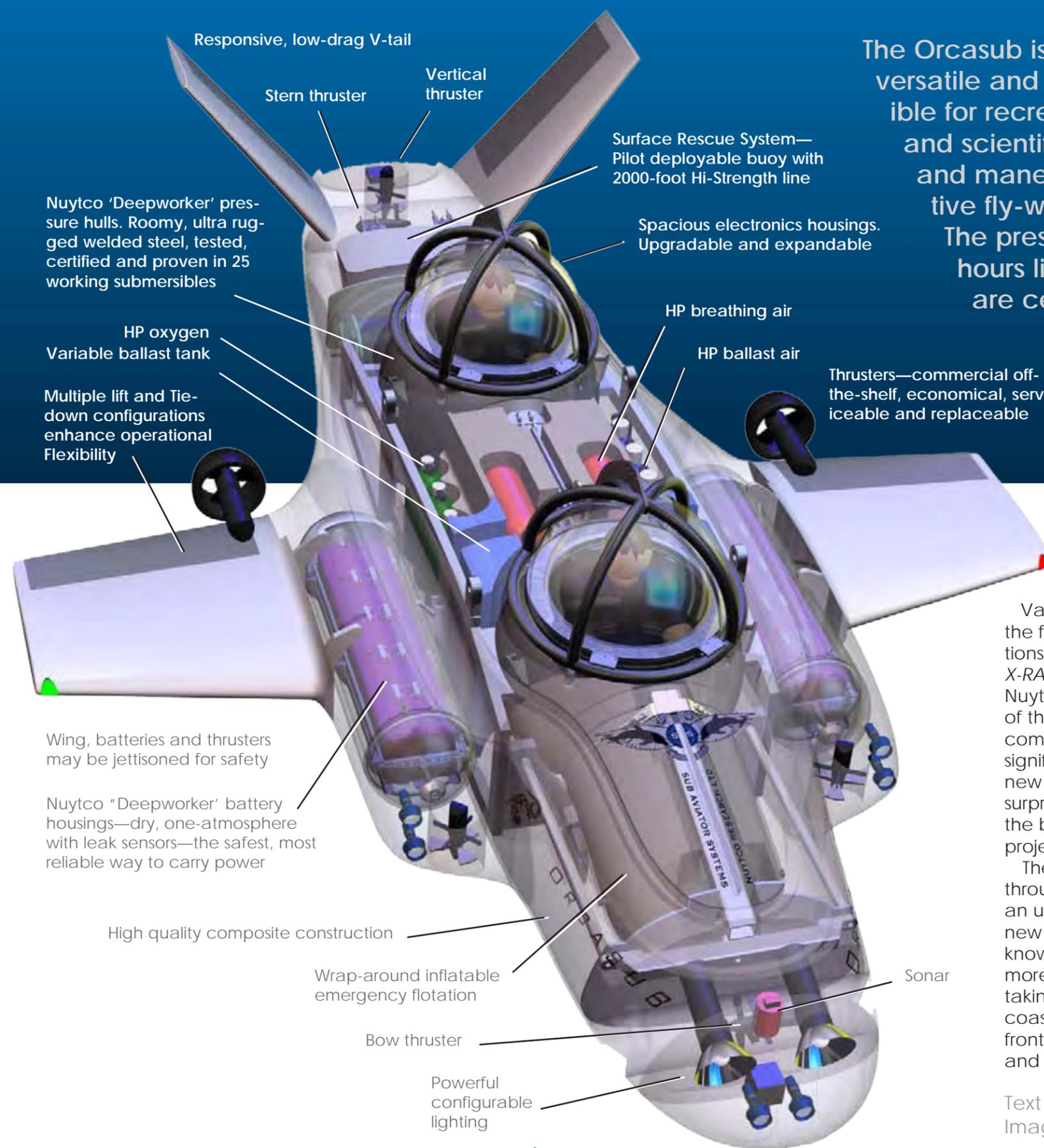


DUI Xm450 Jumpsuit

DUI combined Thinsulate™ Ultra 400 Type BZ with Polartec® PowerStretch® to create the Xm450 Insulation Jumpsuit undergarment. Some features: Thinsulate Ultra 400 for maximum insulation, Polartec PowerStretch panels strategically placed in the armpits, mid-back, around the waist, knees and down the sides of the legs, wind-and-spray resistant outer shell, 2 zippered hand-warmer pockets, 1 zippered chest pocket, thumb and ankle stirrups.

www.dui-online.com





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The Orcasub is a customizable, versatile and innovative submersible for recreational, commercial and scientific uses. It is quick and maneuverable with intuitive fly-wire-joystick control. The pressure hulls and the +80 hours life support systems are certified by Lloyds.



At a recent dive show, we ran into Phil Nuytten, whom we had visited some years back at his workshop in

Vancouver, receiving a tour of the facility and Nuytten's inventions by the man himself. (see X-RAY MAG #9 - 2006). Dr Phil Nuytten is widely regarded as one of the pioneers of the modern commercial diving industry and a significant force in the creation of new technology, so I was hardly surprised when he showed me the brochure for one of his latest projects, the Orcasub.

The first thought that ran through my mind that this was an underwater Ferrari—a sleek new toy for the überich. But who knows, what will one day become more common place, such as taking a Sunday drive along the coastline... not along the beach-front promenade but underwater and along the reef!

One thing led to another and soon I ended up talking with his associate John Jo Lewis from Sub Aviator Systems (SAS) in Bellingham, Washington State. I asked him why they built this new submarine.

John Jo Lewis explains:

The idea behind Orcasub has always been to design a high performance submersible for would-be pilots rather than passengers. It's a sub you buy to fly in for the sheer pleasure of doing it yourself. It's akin to owning a high performance motorcycle or a vintage war plane; you don't do it to be a pillion rider or to stare out the window while someone else is having all the fun. Flight based subs, like the experimental Super Aviator and SAS's forthcoming Orcasub, are a breed apart from most conventionally designed subs built or modified for private owners.

In the past, I think a lot of yacht-based subs have ended up as deck ornaments because either the pilot experience was not rewarding for the sub's owner, or because the experience of being chauffeured underwater as a passive spectator simply lost its appeal after a limited number of dives.

Apart from gratifying the barnstormer in all of us, underwater flight has distinct advantages for those who desire to explore and directly observe life in the ocean as it has never been seen before. Having the ability to go faster and farther, with extreme maneuverability and a nearly 360 degree view, offers nothing less than a new way for humans to experience and be in the ocean environment.

It's hard to explain what this means, but you can start by imagining yourself as a scuba diver

Text by Peter Symes
Images courtesy of Phil Nuytten

If you've been wondering what Dr Phil has been up to lately...

Picking up your mother-in-law in style

Sub Aviator Systems (SAS) was formed by members of the original team of pilots, engineers and expedition crew members who pioneered underwater flight with the experimental Aviator submersible. Aviator was built to test theories about high speed, long range, underwater "flight", and turned out to be an E-Ticket ride for high adrenaline hydrobatic maneuvering. Aviator continues to thrill her pilots, and serves as a uniquely capable platform for high definition video capture, underwater survey and research.

As an experimental craft, Aviator was constructed with some acknowledged limitations such as remaining positively buoyant underwater at all times. This expedient provides a fail safe feature—if power is lost, Aviator happily glides to the surface. ■

cruising above a beautiful reef. The view is amazing because this time it's panoramic and distortion free. You glide along quietly and effortlessly hardly disturbing the schools of colorful fish. Do they think you're a big fish?

You arrive at a wall, turn and gaze down at some grey sharks below as they follow along it. You roll over the wall and increase speed as you angle down to join them on their patrol. You and the sharks round the wall and cross over a plateau. Large formations of soft coral are open and feeding in the strong current, so you decide to angle into it and hover with your companions for awhile.

However the mystery of the wall beckons, so giving the sharks a farewell waggle of your wings, you bank hard and dive again watching the ultramarine blue around you grow darker and darker blue. It might be time to add a little light to the equation. Aren't ultra LEDs wonderful? The terrain is beginning to shelf as you fly downward—passing 400 feet now. How nice not having to worry about the affects of pressure on your body or the ambient air you breathe so naturally.

What's that ahead? Are you seeing things? It can't be nitrogen narcosis because that's not a factor anymore. Looks like a debris field. Will you decide to follow it down or call topside for a GPS fix so you can come back after lunch? You decide to pull back on the stick and jet to the surface. Remember when you had to worry about embolism, the bends, dive time, or surface intervals? Ah, freedom...

If you'd like a taste, Sub Aviators will be offering flight training on our Super Aviator submersible this Spring in the Caribbean, and of course we'd only be too happy to build you an Orcasub of your own. ■

Charters

SAS' new Super Aviator submersible is now available for charters, complete with pilots and crew. Charters for first-time undersea exploration and wreck location, environmental and marine life surveys, climate change study and its related effects, archaeological site surveys, or marine photography or video.

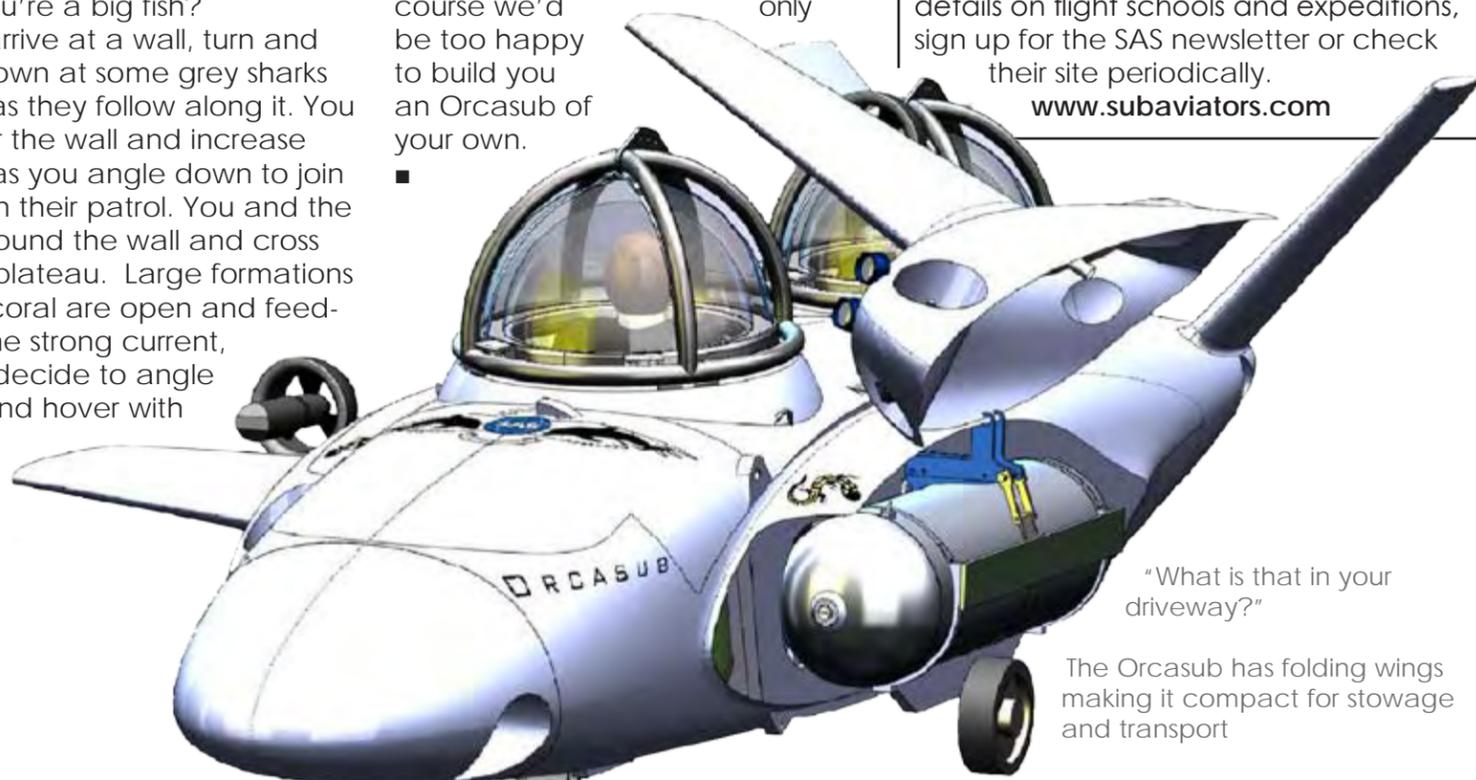
For more information please call 1-888-809-7948 or contact SAS via email.

Underwater Flight School

Sub Aviator Systems LLC is also pleased to announce that it is now taking reservations for Underwater Flight School in the Bahamas, using the revolutionary new Super Aviator submersible, for the fall of 2008 and the spring of 2009.

Please contact Cpt. Alfred S. McLaren, USN(Ret.), Ph.D., Senior Pilot on email alfredsmclaren@aol.com or phone (303)447-0608 as soon as possible to ensure that you secure a training spot in this very exciting new method of exploring the vast and largely unknown undersea world. Future underwater flight training schools are also planned for other ares of the Caribbean, the Sea of Cortez and Lake Tahoe, California. For the latest details on flight schools and expeditions, sign up for the SAS newsletter or check their site periodically.

www.subaviators.com



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technical
matters

The use of rebreathers in caves is nothing new. Decades ago, Hans and Lotte Hass used them to venture into marine caves. Profiles like Rob Palmer in the UK, Bill Stone, George Irvine and Jarrod Jablonski in the USA, or Olivier Isler in Europe, are also strongly linked to rebreathers and cave diving. Recreational cave divers discovered Oxygen CCR in the Navy surplus, then experimented with Draeger Dolphins, and more recently, APD Inspiration. Nowadays, there are many different brands and models, and they become even more popular within the cave diving community worldwide.

Text: by Cedric Verdier
Photos by JP Bresser

Rebreather for Cave Diving

Why?

So, why use a rebreather for cave diving, and what kind of benefits does this type of equipment have compared to the highly reliable conventional Open Circuit scuba?

Extended dive time. One of main advantages of a rebreather is that it makes longer dives possible. In a cave, that translates into extended explorations and the ability to do penetration dives much longer and further than what would be possible with conventional open circuit scuba. But the rebreather also gives an additional safety margin, as it provides the cave diver with more time to handle emergencies. It could be a lost line scenario, where the way to the exit is unknown, or a situation when a team member is lost, and extra time is required

to look for them. A light failure or a complete silt-out is also a situation where extra time is needed, as the progression to the exit is very often drastically slowed down.

Good buoyancy characteristics. In cave diving, buoyancy control is obviously one of the most important skills, as it prevents silt from lifting up off the bottom. With a rebreather, the buoyancy of the tanks remain almost constant throughout the dive. Therefore, it is not necessary with extra weights to compensate for the added buoyancy of tanks going empty towards the end of the dive. Less weight also means a better trim and less energy spent when moving underwater.

Lack of bubbles. A constant problem cave divers face with OC scuba is called percolation. Bubbles make their way to the walls and the ceiling of the cave and dislodge some silt. This is not an issue when diving with a rebreather. It also helps improving communication (it's possible to talk in the mouthpiece) and maintains the silence that most people are looking for in a cave.

Mixed-gas flexibility. A mixed-gas CCR offers quite a lot of benefits for the

The rebreather also gives an additional safety margin, as it provides the cave diver with more time to handle emergencies.

exploration of unknown cave systems. Dive planning is easier when it comes to gas mix selection, even if one doesn't know exactly how deep the cave is; the same diluent can be used for a larger depth range than the same mix used on OC. A mixed-gas CCR also gives the best decompression mix when it's time to ascend—and it could be quite often during a cave dive—ending up with a perfect yo-yo profile.

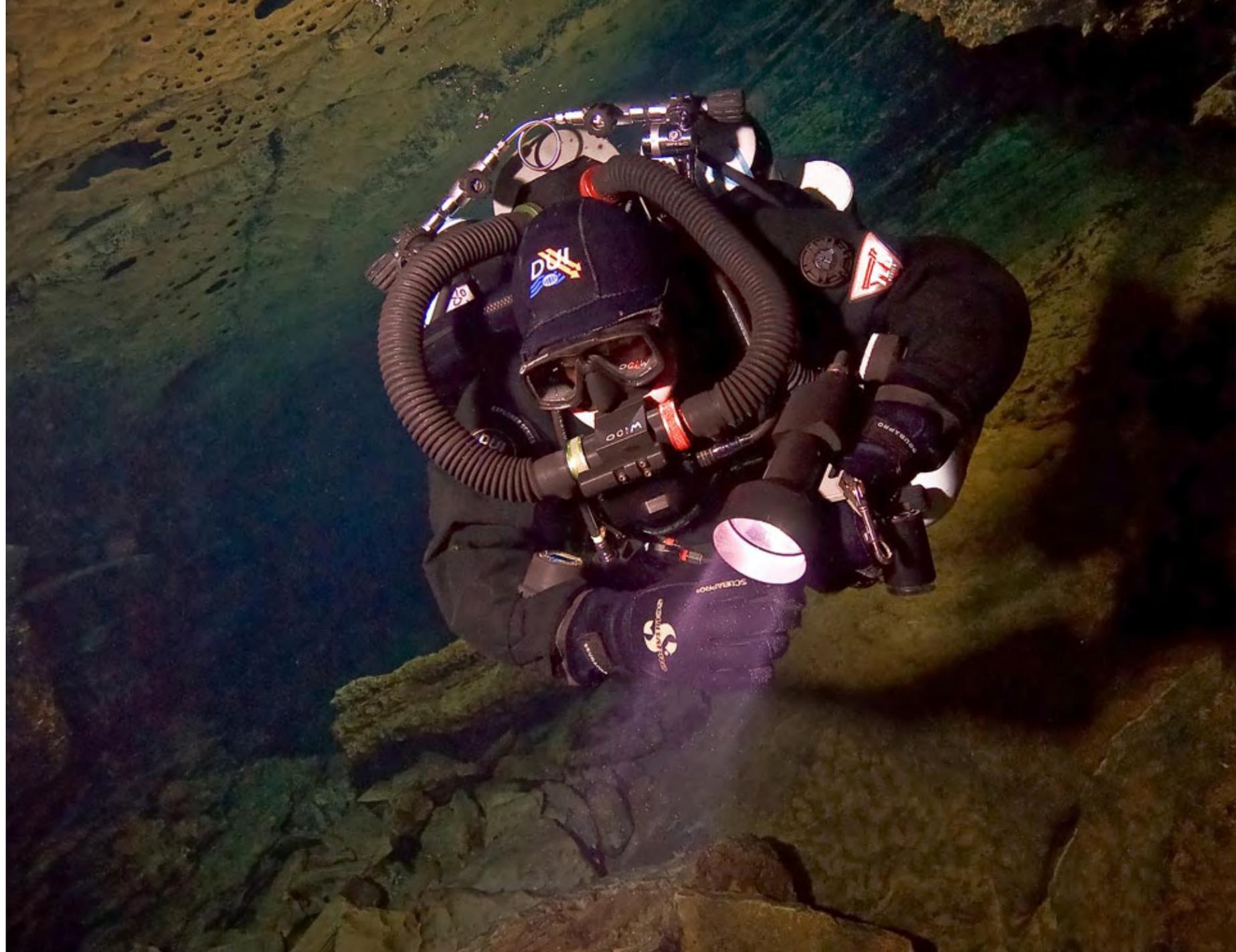
Warmth. Most of the cave systems are

located in cold/cool water (with the exception of places like Mexico and Cuba). A rebreather provides divers with some additional warmth, as they are breathing warm circulated air rather inhaling cold air from a tank—a definite benefit when the total dive time is a matter of hours.

Weight. Many caves are in remote areas. When a cave diving team wants to explore some deep caves, the amount of gas to be carried is some-

With a rebreather, the buoyancy of the tanks remain almost constant throughout the dive.

times unrealistic if the dives have to be done on conventional scuba equipment. Regardless of the bailout gas to be used, rebreathers help to have smaller and more flexible logistics. A booster pump and a few tubs of sodalime give the opportunity to explore virtually any cave system.



*Obviously
rebreathers are
very useful tools
for the cave
explorer.*



But simply having a rebreather is not enough to go cave diving. There are some necessary features and safety components that need to be there.

A Head-Up Display. An HUD is a key piece of equipment for safe cave diving. It tells you if you are breathing the right mix and can even inform you about other potential problems (O₂ sensors, battery power, decompression requirements, etc). All this information is normally

displayed on the handset(s), but in a cave, you need your hands free to perform other tasks like reeling in and out the guideline, setting up a jump, squeezing through a restriction, riding a scooter, mapping, etc. In an emergency situation (complete light failure), one can even use the small amount of light made by the HUD to keep a visual contact with the line while looking for a back-up light.

Trim. Some rebreathers have a tendency

to make the diver bottom heavy. It could be because of their different components (tanks and scrubber, OTS or back-mounted Counter-Lungs, etc) or because of the diver him/herself and the dive gear (dry/wet suit, heavy fins, canister light, etc). Before venturing into a cave, it's essential to make sure that the trim is appropriate (horizontal position, slightly head-down feet up), thanks to some adjustments and maybe some trim weights. It's also important that the configuration is streamlined

and free of danglies (LP hoses, handset cables, etc).

Off-board gas switching capability. For cave diving, this is a very important feature. It gives you the possibility to use different off-board cylinders and to plug them into the loop. In case of gas depletion, electronics failure, equipment failure, scrubber failure, the diver can still stay on the loop while manually flying the unit, (Closed, Semi-Closed or open loop

mode). The additional cylinders significantly increasing the possible duration and range of the diver, it would then be nice to make sure that all the fittings are the same and that all additional tanks (sling or staged) have an LP hose fitted.

A safe way to the exit. All cave divers have to make sure that they can safely come back to the exit (and the surface!) if they have to go off the loop for any reason (mainly Total Loop Flooding



or severe hypercapnia). In most of the cases, it means carrying enough Open Circuit gas for a complete bail-out exit, but it could also be a Bail-out Rebreather when the amount of gas needed is simply too big.

A Bail-Out Valve. A BOV is very useful to have on a rebreather when cave diving to avoid task loading in case of emergency. When something goes wrong with the rebreather, it is safer and easier to quickly switch to Open Circuit, sort the buoyancy out, lock off the reel, etc., then check out what happens and what to do. Furthermore, a diver suffering from CO₂ toxicity might have a hard time removing their mouthpiece and replacing it with a regulator because their breathing action is involuntary. If they try, there is a real risk that they will breathe in water. When using a rebreather in a cave, CO₂ toxicity is a very real possibility when one has to fight against a current or go through a restriction. A BOV is a quick and safe solution, at least for some sanity breaths, time to calm down and switch to the OC bailout tank.

Potential problems

Obviously rebreathers are very useful tools for the cave explorer. Nevertheless, the two main problems that could occur are:

Improper time management. As a rebreather gives additional dive time for cave diving, one can easily extend their oxygen exposure or deplete one tank. Going beyond the scrubber duration could also be a concern.

Task-loading. Never forget that cave diving is a very demanding activity. There are simply so many things to do and to think about. Situation awareness is an important component of every cave dive. Therefore, adding another task loading equipment like a rebreather doesn't help to deal with the normal flow of a cave dive, and even less when dealing with an emergency situation.

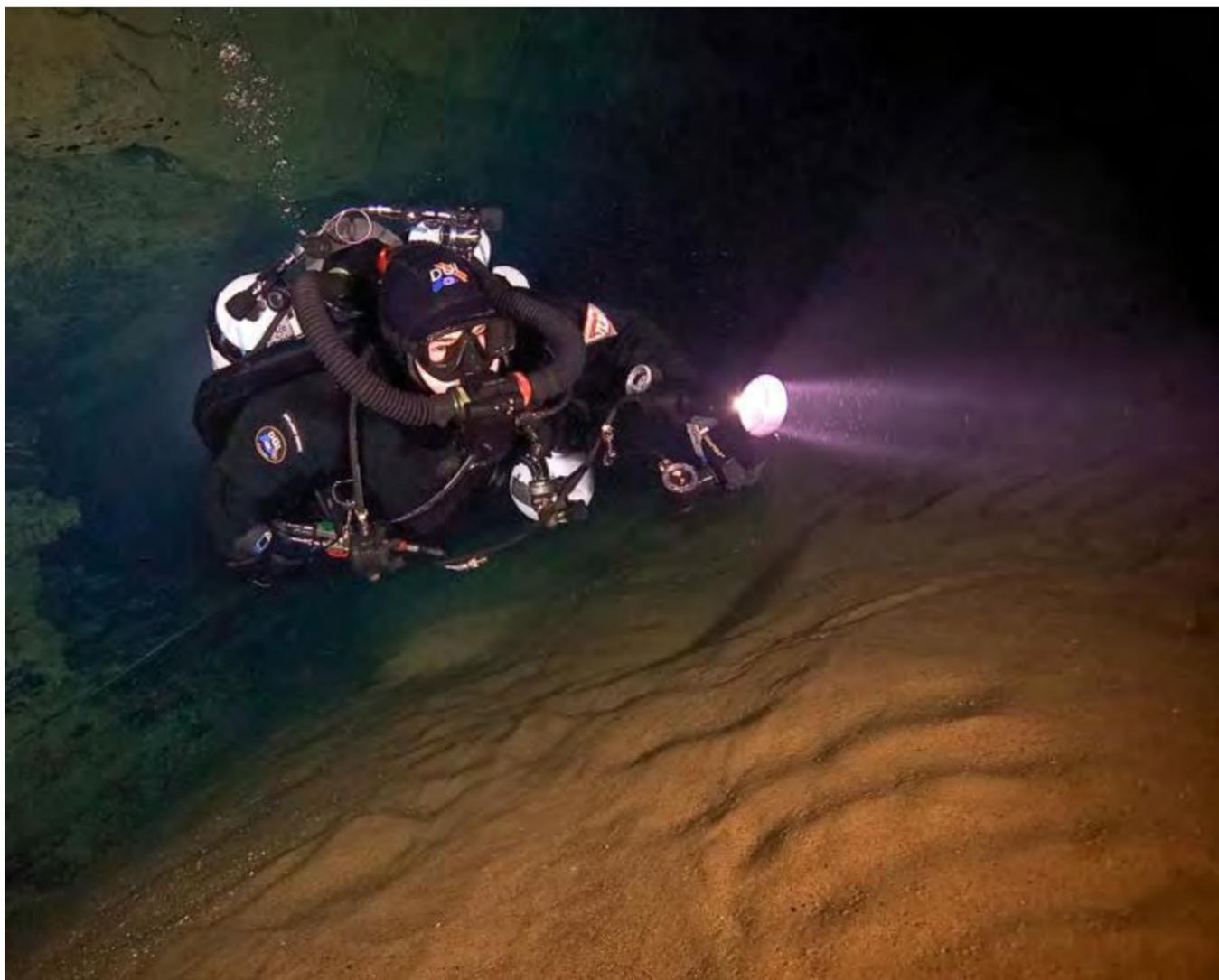
Discipline

As we often say when teaching cave diving courses, "Cave diving is not for everyone!" Add rebreathers to the equation, and we would say, "Cave diving with a rebreather is definitely not for everyone!" One has to be a very experienced CCR diver before starting any dive in an overhead environment. The main attribute of a CCR Cave diver is *discipline*. One

needs discipline not to exceed the so-easily-exceeded limits. If one exceeds their limits and gets away with it very often, it could seem safe to do so.... until the day something goes wrong, which could take years to happen.

A rebreather is a very convenient tool to further explore a cave system. It's also a good solution for some of the emergency situations that can occur in a cave. Nevertheless, despite all of the benefits listed above, it's not an easy-to-use tool that can be immediately adapted to one's needs. An experienced OC cave diver or an experienced rebreather diver needs time to be able to safely combine both techniques. When they reach this state, they get the best of both worlds! ■

Never forget that cave diving is a very demanding activity



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The silent invasion of 'immortal' jellyfish

Turritopsis nutricula is the only known animal that is capable of reverting completely to its younger self. Marine biologists say the jellyfish numbers are rocketing because these creatures need not die.

"We are looking at a worldwide silent invasion," said Dr Maria Miglietta of the Smithsonian Tropical Marine Institute. The jellyfish are originally from the Caribbean but have spread all over the world.

Life cycle

The fertilized eggs develop in the stomach and in the screen formed by

the cave in the jellyfish planula. The eggs are then planted on the seabed in polyp colonies. The jellyfish hatches after two days. The jellyfish becomes sexually mature after a few weeks depending on the ocean temperature.

While most members of the jellyfish family usually die after propagating, the *Turritopsis nutricula* has developed the unique ability to return to a polyp state. This is done through a cell change in the external screen through the cell development process of

transdifferentiation. The ability to reverse the life cycle is probably unique in the animal kingdom, and allows the jellyfish to bypass death. Theoretically, this cycle can repeat indefinitely, rendering it biologically immortal.

Having stumbled upon the fountain of eternal youth, this tiny creature, which is just 5mm long is the focus of many intricate studies by marine biologists and geneticists to see exactly how it manages to literally reverse its aging process. ■

Jellyfish protein effective in treating arthritis

A glycoprotein found in jellyfish is effective in the treatment of osteoarthritis, a team of Japanese researchers has found.

Osteoarthritis is a condition caused by aging and injury in which cartilage in the joints wear thin, making walking difficult. Hyaluronic acid injected into the joints delay its progression, but no fundamental cure exists.

The protein qniumucin was discovered in Echizen jellyfish in 2007. It has a structure similar to that of mucin, the main substance found in human stomach acid.

Masato Sato, an associate professor at Tokai University, and his colleagues focused on the fact that the levels of mucin found on the surface of cartilage in the joints of people suffering from osteoarthritis were low. Tests conducted on rabbits with osteoarthritis found more cartilage recovery among those injected with both hyaluronic acid and

qniumucin extracted from moon jellyfish and Echizen jellyfish, than with those who were injected only with hyaluronic acid. The extent of cartilage damage and the area affected also greatly improved among the former group.

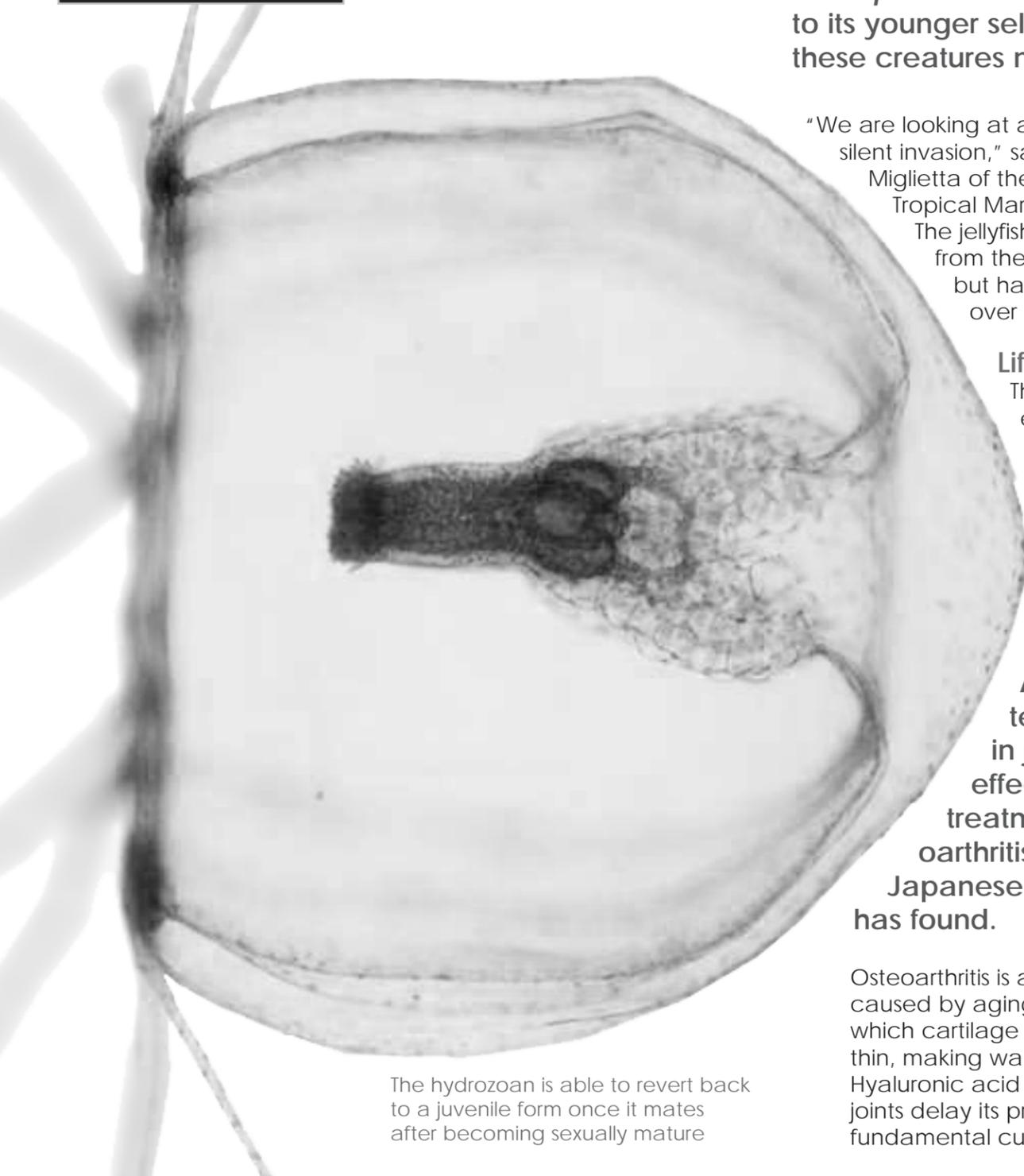
"We suspect that the hyaluronic acid wraps itself around the qniumucin, creating a synergistic effect that allows the substances to remain in the cartilage for a longer time," says Sato. "We'd like to make this applicable for people after confirming its effects on larger animals." ■

Jellyfish Trivia

Environmental Change and Jellyfish Blooms

1. One third of the total weight of all life in Monterey Bay is from gelatinous animals.
2. Three minutes after a person is stung by a deadly box jellyfish, she or he may be dead.
3. Eight years after fast-reproducing comb jellies invaded the Black Sea, they dominated it.
4. Twenty to 40 people are killed annually from box jellyfish stings in the Philippines alone.
5. One hundred foot-long tentacles may dangle from the Lion's Mane Jelly.
6. Four hundred vast Dead Zones in the world oceans are too polluted for almost all life except jellyfish.
7. One thousand plus fist-sized comb jellies filled each cubic meter of water in Black Sea jelly blooms.
8. 45,000 eggs may be released daily by a single jellyfish.
9. 500,000 people are stung by jellyfish in the Chesapeake Bay annually.
10. 500 million refrigerator-sized jellyfish float into the Sea of Japan daily during blooms.

SOURCE: THE NATIONAL SCIENCE FOUNDATION



The hydrozoan is able to revert back to a juvenile form once it mates after becoming sexually mature