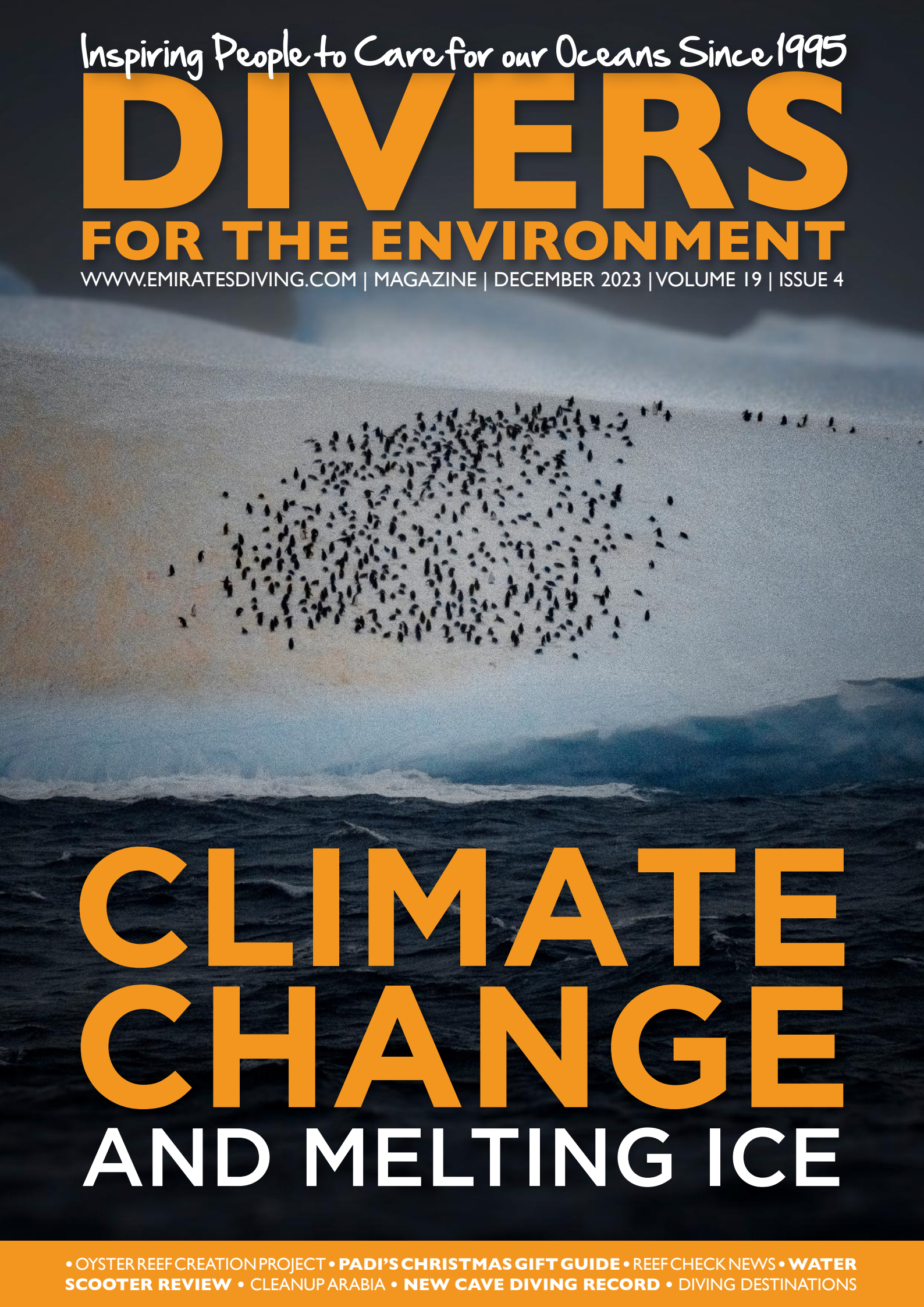
Inspiring People to Care for our Oceans Since 1995

DIVERS FOR THE ENVIRONMENT

WWW.EMIRATESDIVING.COM | MAGAZINE | DECEMBER 2023 | VOLUME 19 | ISSUE 4



CLIMATE CHANGE AND MELTING ICE

• OYSTER REEF CREATION PROJECT • **PADI'S CHRISTMAS GIFT GUIDE** • REEF CHECK NEWS • **WATER SCOOTER REVIEW** • CLEANUP ARABIA • **NEW CAVE DIVING RECORD** • DIVING DESTINATIONS

FOR THE OCEANS

OCEAN STORIES | CONSERVATION | DIVE TRAVEL

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Beautiful photography and captivating stories, by divers for divers!

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EDA
جمعية الإمارات للغوص
Emirates Diving Association

Tel: +971 4 393 9390 | **Email:** projects@emiratesdiving.com | **Website:** www.emiratesdiving.com
EDA is a non-profit NGO accredited by UNEP as an International Environmental Organisation.

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EDA
جمعية الإمارات للغوص
Emirates Diving Association

REGULARS

NEWS

KIDS CORNER

REEF CHECK

PRODUCT REVIEWS

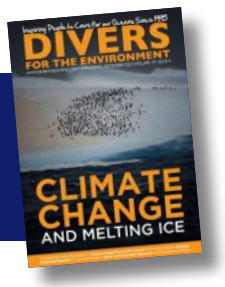
DIVERS FOR THE ENVIRONMENT

Please note that EDA's magazine, 'Divers for the Environment' includes articles written by individuals whose opinions', whilst valid, may or may not represent that of EDA's. The magazine is a platform for individuals to voice their opinion on marine and diving related issues. You are welcome to suggest an article for the next issue released in March 2024. Send all articles, feedback or comments to: **magazine@emiratesdiving.com**

COVER

PHOTO BY LORENZO MITTIGA

Climate Change and Melting Ice – Adélie penguins eat so much krill that it turns their guano (their poop) a vibrant pinkish-red colour.



REDUCE REUSE RECYCLE

FEATURES

DIVING DESTINATIONS

HEALTH & SAFETY

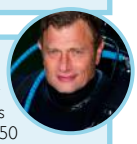
EDITOR & GRAPHIC DESIGNER

ALLY LANDES
Ally is EDA's Project Director, Event Planner, Graphic Designer, Editor, and Photographer. She created and introduced 'Divers for the Environment' back in December 2004 as a free educational tool to share information by scientists, conservationists, underwater photographers, and other like-minded individuals from all over the world with a passion to conserve and protect our delicate marine life and underwater world.

THE CONTRIBUTORS

Meet the quarterly contributors who share their passions and stories with our readers. Want to contribute? Email: **magazine@emiratesdiving.com**

LORENZO MITTIGA
Lorenzo Mittiga is an Italian marine conservation visual story-teller, Marine Biologist and an Aqua Lung Ocean Ambassador. Based on Bonaire, Netherland Antilles, he works as a full time photographer specialising in underwater photography. **www.lorenzomittiga.com**



FRANCIS LEGUEN
Francis is a photojournalist, an author and presenter of a television series devoted to the sea (more than 150 programmes around the world), a writer and collection director at Glénat. A diver-explorer with nearly 40 years experience (several world records in cave diving), and the founder of press titles. Francis is an expert in new media.
www.francis-leguen.com

ALDO GUSTAVO GALANTE
Cardiovascular Surgeon, Rescue Diver and Underwater Photographer. Aldo has travelled to 76 countries, in which he has dived 42 of them. He began his underwater photography in 1996, focusing mostly on capturing exotic species and has portrayed marine life amongst marine debris since 2005.
Instagram: @aldogalante8

PHILIPPE LECOMTE
Having followed in his father's and brother's love for the sea, French diver and underwater photographer Philippe, took to underwater photography in 2006 after having moved to Abu Dhabi in 2003 and now seldom travels without his camera.
www.plongee-passion-photo.over-blog.com

PATRICK VAN HOESERLANDE
Diving opens up a whole new world. Being a writer-diver and co-editor of the Flemish divers magazine, Hippocampus, Patrick personally explores our underwater world and shares his experiences through his articles. You'll find a collection of them on **www.webdiver.be**.

GORDON T. SMITH
Gordon has lived and dived in the Middle East region for the past 36 years. He is a frequent visitor to south east Asia, in particular to Indonesia and the Philippines. Nudibranchs and seahorses are his favourite subjects, and he's always ready to dive in the UAE due to the variation in subjects he encounters.
www.instagram.com/gordon.t.smith

COP28 UAE

SPIRIT OF THE UNION 2023

IBRAHIM AL-ZU'BI
Co-Founder

As we celebrate the 52nd UAE National Day this year, reflecting on the spirit that ties us all together, we also embrace COP28 UAE!

This will be a milestone moment when the world takes stock of its progress on the Paris Agreement. The first Global Stocktake (GST) will provide a comprehensive assessment to help align global efforts on climate action, including measures that need to be put in place to bridge any gaps in progress. The COP28 UAE presidency will work to ensure that the world responds to the GST with a clear action plan.

What an incredible Cleanup Arabia event we had for 2023! We couldn't be prouder of our ocean loving community of partners and members. We had a total of 171 participants turn up out of the registered 214, and we collected a total of 1,359.64kg in this year's campaign! This was an incredible group effort.

Well done to everyone for removing as much rubbish as was possible from the beach and underwater, and to everyone who counted and weighed all the items, and an especially big round of applause to the kids who participated! Hard work pays off, but you all made it so much fun and so rewarding.

In this issue, we share so many great ocean stories from passionate contributors. Don't miss out on this issue's diving destination recommendations, this quarter's product review, and PADI's Christmas gift guide. There's something for everyone.

We're also incredibly humbled and honoured to have received the PADI 2023 Outstanding Contribution to Ocean Conservation award! We thank you for the nomination.

I would like to wish everyone a happy 52nd UAE National Day. I also want to wish you all a Merry Christmas, and a Happy New Year. We look forward to seeing some of you at COP28, and we will see the rest of you in the New Year at the next EDA events and activities!

Happy reading and safe diving,

Ibrahim Al-Zu'bi

AN EDA MOVIE SCREENING
THE DEEP MED

The Emirates Diving Association held the Members' Movie Screening of 2023 on the 2nd of November at Deep Dive Dubai, showcasing the beautiful documentary film, The Deep Med by Gil Kébaili, and Laurent Ballesta. It was a huge success and declared EDA's best screening of 2023 with its incredible photography and cinematography.

SYNOPSIS

People have travelled to the Mediterranean for thousands of years, and it is believed to have no secrets. And yet, far below its surface, lie vast unexplored territories, luxurious gardens worthy of the finest tropical coral reefs. These natural wonders are inaccessible to the traditional diver, set in a twilight zone between 60 and 120m, where there is less than 1% of sunlight. If diving at such depths is always a challenge, staying there is regarded a fantasy, but this utopia becomes a reality in The Deep Med.

In the tradition of Jacques Cousteau and his "homes under the sea", Laurent Ballesta's team undertake a new world-record setting mission in July 2019: to spend 28 days in a pressurised 55sqft capsule allowing them to dive into the 100m zone as they wish, in complete freedom and without time constraints.

From Marseille to Nice, the 4 adventurers reveal the remarkable treasures of biodiversity hidden in the Mediterranean, and study the unknown ecosystems of its depths.

WANT TO JOIN OUR EVENTS?

EDA Movie Screenings are only accessible to EDA members. Members must register by email to join our social events, or to receive the special link (subject to availability) to view the films online.

Visit our website to acquire EDA membership, or to renew it, here:
www.emiratesdiving.com/membership-form


PLANÈTE
UN FILM DE GIL KÉBAÏLI
UNE EXPÉDITION DE LAURENT BALLESTA
MÉDITERRANÉE
BLANCPAIN
FONDATION PRINCE ALBERT II DE MONACO
Explorations de Monaco
ANDROMEDE
LES GENS BIEN
arte
CNC
RÉGION SUD
Ushuaïa TV

A PRESENTATION FOR EDA MEMBERS
NATURETECH FOR ACTIVE CORAL REEF RESTORATION

On the 19th of October, Archireef presented their Naturetech for active Coral Reef Restoration project to our EDA members at our wonderful partner venue at Deep Dive Dubai. Archireef's Co-founder and Chief Commercial Officer, Deniz Tekerek gave an illuminating talk about the company's 3D-printed Reef Tile (the world's first) made from clay which was followed by an engaged Q&A.

What makes Archireef unique?
Our mission is simple, we are dedicated to assisting the recovery of coral ecosystems through innovative eco-engineering solutions. Our solutions are designed for the foundational species, in this case, it's coral-centric, as we believe that they are the best architects to create the natural habitats for the associated biodiversity. Our patented 3D printed coral reef tiles integrate biomimicry and non-toxic materials. They are modular, weigh around 12kg, and can be scaled at pace, placed on the seabed by divers and without the need for heavy machinery unlike other methods. We are driven by our mission and are working on creating private-public partnerships in order to scale and speed up our impact. Sustainability is a team effort, by joining forces we can achieve so much more.

What problem are you trying to solve?
We have already lost 50% of our coral reefs, and if we don't act now, most of the world's coral reefs will be gone by the end of this century. This is particularly important because the world has a huge dependency on corals. Coral reefs are home to 25% of all marine life. They are a food source for over 1.2 billion people, delivering $36 billion a year in tourism dollars.

Land-based pollution and land reclamation are some of the biggest threats to corals as they contribute to the loss of a natural substrate on ocean floors, leading to coral reef degradation and loss. Archireef is re-creating a natural substrate for corals to grow and thrive on.

Can you tell us how the tiles have helped marine life and coral ecosystems so far?
Archireef has deployed an area of over 500 square metres in Hong Kong and Abu Dhabi over the past two and a half years. We have been studying the associated biodiversity around coral and have seen a significant increase in fish and invertebrates such as crabs, shrimp and sea cucumbers. This is helping us to prove that our tiles can enhance the abundance and biodiversity of reef fish. We have also been using environmental DNA to fully quantify and capture biodiversity that we cannot see with the naked eye, which is all very exciting. However, it takes time for nature to recover, and change won't happen overnight. As part of our business model, we conduct regular monitoring and report our findings to our clients over a minimum period of three years. This allows them to monitor the ecological impact with us and is part of our three-step model, which includes defining the restoration site and scope of the project, deploying the reef tiles and then monitoring how the tiles are performing.

What kind of partnerships do you have in place to ensure the sustainability of your work in the long-term, and do you partner with local communities to ensure longevity of your projects?
While we mostly work with the private sector and market our solutions to large corporations, we also partner with local government entities, NGOs, and universities to achieve the best outcomes for nature.

One fruitful partnership we've been able to forge is that with the Environment Agency - Abu Dhabi (EAD). The EAD have been critical to our success in Abu Dhabi given their depth of local marine ecosystem knowledge and in-house expertise, which we have rarely seen elsewhere. This partnership enabled us to operate with more confidence and take guidance from the real local experts.

To encourage longevity, our commercial partners commit to long-term subscriptions with us. During these subscription periods, the Archireef team continues to maintain and monitor the installations by performing regular health checks, tracking the growth of corals, taking and processing environmental DNA samples, and more.

In addition to this, our Reef Tile installations as well as our ocean literacy workshops are a natural draw for local communities. During installations, members of the local community can get involved and learn more about the challenges corals face, and our workshops help children and adults better appreciate and respect marine ecosystems.

For more information, go to: **https://archireef.co**


Archireef









Archireef
EDA

Archireef
Pico



WORLD CLEANUP DAY 2023

A CLEANUP ARABIA EVENT IN COLLABORATION WITH DUBAI MUNICIPALITY

EDA ran a small Cleanup Arabia event in collaboration with Dubai Municipality on the 16th of September for World Cleanup Day 2023. We ran our beach clean-up at the Zero Gravity end of JBR Beach and collected 20kg of rubbish.

From that, we collected 1,390 cigarette butts for Goumbook's 'Save The Butts – waste to value campaign' which will be recycled into a new circular material.

A big shout out to our members and Dubai Municipality for joining forces.

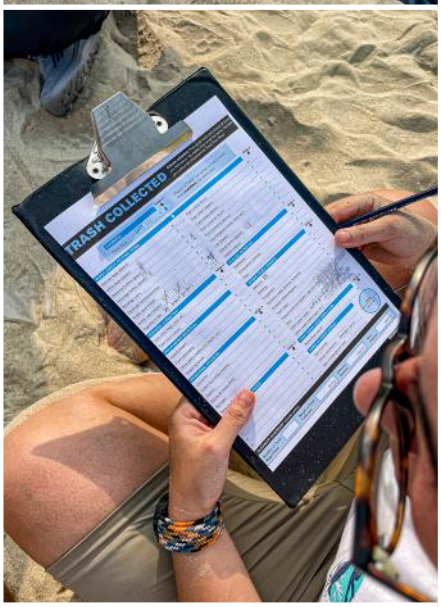



Photo by Tom Segers


Photo by Dubai Municipality

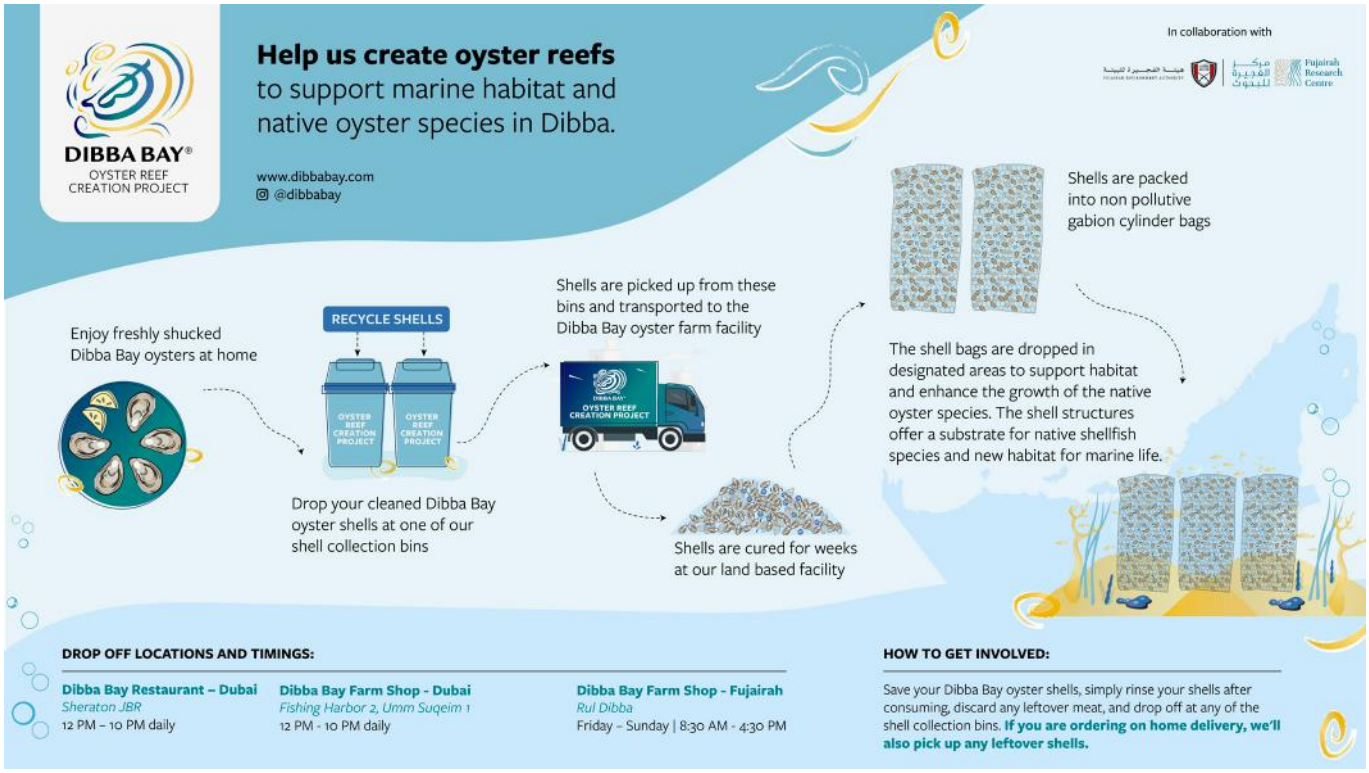
BEACH CLEAN-UP | DUBAI	
JBR Beach | 25 Adults + 2 Kids	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Grocery Bags (plastic)	2
Other Bags (plastic)	6
Beverage Bottles (plastic)	28
Beverage Cans	3
Bottle Caps (metal)	12
Bottle Caps (plastic)	120
Cigarette Butts	1,390
Cups, Plates (foam)	1
Cups, Plates (paper)	8
Cups, Plates (plastic)	3
Food Containers (plastic)	6
Food Wrappers (candy, chips, etc)	86
Lids (plastic)	3
Straws/Stirrers (plastic)	50
FISHING & BOATING	
Line, nets, traps, rope, etc	31
PACKAGING MATERIAL	
Foam Packaging	2
Other Plastic Bottles (oil, bleach, etc)	1
ILLEGAL DUMPING	
Construction Materials	21
PERSONAL HYGIENE	
Cotton Bud Sticks (swabs)	5
Diapers	2
Gloves & Masks (PPE)	3
Syringes	4
OTHER ITEMS/DEBRIS	
Balloons	28
Clothing	3
E-cigarettes	1
Footwear (shoes/slippers)	1
Tobacco Products (lighters, wrap)	2
Other Plastic Waste	360
Other Waste (metal, paper, etc)	61
TINY TRASH LESS THAN 2.5CM	
Plastic/Foam Pieces	173
OTHER ITEMS NOT LISTED	
Aerosol Spray Can	1
Sky Diving Strap	1
Car Floor Mat	1
Nurdles	50
Metal Chain	1
GRAND TOTAL OF ITEMS	**2,469**
TOTAL BAGS COLLECTED	**1**
TOTAL WEIGHT (KG)	**20**


CLEANUP
ARABIA


EDA


Photo by Dubai Municipality

DIBBA BAY LAUNCHES
THE OYSTER REEF CREATION PROJECT
CHAMPIONING MARINE ECOSYSTEM DEVELOPMENT & RESTORATION



Dibba Bay Oysters, the only gourmet oyster farm in the Middle East, proudly announces the launch of the Dibba Bay Oyster Reef Creation Project. This ambitious initiative seeks to create a 700m structure to rejuvenate and protect marine ecosystems in Dibba, Northern Fujairah, UAE by recycling oyster shells to build oyster reefs.

In collaboration with the Fujairah Environmental Authority and the Fujairah Research Centre, the Dibba Bay Oyster Reef Creation Project is geared towards nurturing the growth of native shellfish species in Dibba. The primary focus of this initiative is to establish marine ecosystems and habitats while providing a dedicated area for conducting essential environmental research, including activities such as monitoring native shellfish populations and coral seeding.

The project involves collecting recycled Dibba Bay oyster shells, curing them at the Dibba Bay oyster farm, and packing them in non-pollutive gabion cylinders that are 80cm high. The shell structures are then returned to the ocean in Dibba where they act as substrates to support the settlement of marine life, thus providing the building blocks of vibrant new ocean reef habitats.

Ramie Murray, Founder of Dibba Bay Oysters, emphasises the importance of these


Before | March 2022

structures, stating, "Oyster reefs have long been recognised as vital ecosystems for marine biodiversity, playing a crucial role in maintaining water quality, providing habitat for various aquatic species, and protecting coastlines from erosion. By diverting used oyster shells from landfills and using them to build oyster reefs, we can make a significant positive impact on the health of our oceans."

The Dibba Bay Oyster Reef Creation Project not only involves the careful collection of oysters from Dibba Bay outlets in Dubai but will also engage partner hotels and restaurants in Dubai and Fujairah, inviting them to join the effort to donate their empty Dibba Bay oyster shells. This is an open call for hotels and restaurants who wish to partner in the project to reach out to **info@dibbabay.com**. There are also corporate sponsorship opportunities available for those who want to contribute to the build and maintenance of the reef. For consumers, there are shell recycling bins at Dibba Bay outlets in Dubai where oyster shells can be dropped off. Dibba Bay is also offering a shell collection service for home delivery customers.

Mr Murray further explained, "We believe in the power of community involvement. By partnering with our hotel and restaurant clients as well as our direct customers, we can expand the reach of our project and inspire more people to take an active role in preserving our coastal ecosystems."

The Dibba Bay Oyster Reef Creation Project represents a significant pillar in Dibba Bay's commitment to environmental stewardship and sustainable seafood practices. It aligns with their mission to provide consumers with sustainably farmed oysters while simultaneously giving back to the marine environment that sustains them.

For more information on the Dibba Bay Reef Creation Project and how to get involved, visit: **www.dibbabay.com**

After | August 2023. Photo by Freestyle Divers. These are before and after photos of a coral nursery table filled with cured Dibba Bay oyster shells deployed in Dibba, Fujairah which resulted in the successful creation of a marine habitat with seeded coral growth.

LOCAL EDA CONSERVATION IMPACTS

EDA is introducing plans to individual EDA Members to opt into our new scheme to support local conservation projects. This is totally optional and not enforced in any way.

EDA members have been removing plastics from our beaches and waters since 1995 through our Cleanup Arabia campaign. To date, we have removed 57,898.79kg of rubbish! We all want to do more to help save the ocean and fix the climate. Our eastern coastlines sit on the warmest sea on the planet, and we need to stop it from getting even hotter.

Starting in January 2024, we have the opportunity to help other local projects, and Dibba Bay's Oyster Reef Creation Project is the first to have opened up to EDA with the plan of AED15/ month. EDA members will be able to opt in to the Local EDA Conservation Impacts when they acquire or renew their membership starting in January by paying an extra AED180/year, on top of their AED100 EDA membership fee. 100% of your impact fund goes to the Oyster Reef Creation Project.

Your annual donation will go towards building and maintaining the 700m long, 40m wide reef:

- Each member who opts into the plan, will receive an Impact Certificate.
- Dibba Bay will provide an impact report at the end of the year which we will publish in the next December magazine issue.
- We will also list each member who has taken part in the impact.
- This may eventually become a Reef Check survey site for our ecodivers.

Conservation is for absolutely everyone, and as an ocean loving community we want to bring you on the journey in our conservation objectives. As an environmental marine organisation, we create communities and connections, and provide a platform for education, and we collaborate with our allies to create sustainable solutions for life.

Individually, we can't provide sponsorship at a corporate level, but collectively, we can provide support as a community under the EDA umbrella.

Join us in taking small steps to make a big impact!

EDA HAS RECEIVED THE PADI 2023 OUTSTANDING CONTRIBUTION TO OCEAN CONSERVATION AWARD

The Emirates Diving Association (EDA) received the PADI 2023 Outstanding Contribution to Ocean Conservation award for empowering communities in the UAE to take action for ocean conservation. "EDA is playing a major part to facilitate a course of action for the UAE scuba diving communities, this goes in line with PADI Pillar 1 – Ocean Conservation" says Firas Jundi, Regional Manager of Middle East for PADI. "Inspired by the diver in the PADI logo and our legacy ethos to protect the underwater world, we created the PADI Torchbearer Community as a way to mobilise millions of divers – and anyone with the desire to explore and protect the ocean – to take collective action for the ocean above and below the surface. We thank EDA for actively pursuing a course of action to address ocean challenges by engaging local communities to protect the ocean."

DIVE INTO THE FESTIVE SPIRIT: SANTA'S GROTTO COMES TO JA RESORT!

This holiday season, Chloe Blue Diving Club is thrilled to announce the launch of an extraordinary and enchanting event: Santa's Underwater Grotto at the prestigious JA Resort. Catering to the young adventurers aged 8-10 years old, this unique underwater experience promises to be the highlight of the festive season in Dubai.

EVENT HIGHLIGHTS:

Santa's Underwater Grotto is a one-of-a-kind event that brings the magic of Christmas to the depths of the JA Resort swimming pool. Every Sunday leading up to Christmas, from 3-4pm, children will have the opportunity to meet Santa Claus beneath the surface, creating magical memories that will last a lifetime.

KEY ACTIVITIES:

- **Underwater Santa Encounter:** Watch the joy on your child's face as they share their holiday wishes with Santa in an enchanting underwater setting.
- **Christmas Hoops Challenge:** Kids will navigate Christmas-themed hoops, adding an element of excitement and adventure to their underwater experience.
- **Bubbling Fun:** Our experienced instructors will teach young divers the art of blowing bubbles underwater, making the event not just festive, but educational.
- **Capture the Moment:** Parents will receive a professional photo session to preserve the magical moments of their child's underwater rendezvous with Santa Claus.

REGISTRATION INFORMATION:

- **Cost:** AED399 per child
- **Limited Spots:** To ensure an intimate and personalised experience, limited spots are available. Early registration is recommended.

HOW TO REGISTER:

- Visit our website:
  www.chloebluescubadiving.com
- Call our hotline:
  +971 58 587 0521
- Email us at:
  godive@chloebluescubadiving.com

PADDLE OUT FOR COP28

A PEACEFUL CAMPAIGN FOR OCEAN HEALTH + HUMAN HEALTH

ABOUT THE EVENT

The Paddle Out for COP28 is a symbolic community gathering in the ocean, uniting surfers, SUPers, divers, ocean lovers and ocean stewards to raise awareness for ocean conservation during the biggest event for climate change in the world: COP28.

Believed to have begun as an ancient Hawaiian tradition, a paddle out is a ceremony typically used to celebrate and pay tribute to surfers who have passed away. Paddle outs have evolved beyond the concept of memorials and are now a way of honouring or paying tribute to other causes related to the ocean.

This Paddle Out is an activity where attendees will paddle from the beach out to the sea, following a route of 2km, where they will form a circle and pay tribute to the ocean.

Paddlers can use SUP (stand up paddle boards), surf boards, kayaks, dragon boats, or other water vessels.

We are forming a circle in the ocean where we will link together, and set our intentions for a better world, improving ocean conservation, and reflecting on how the ocean can help our mental health.

TIMINGS

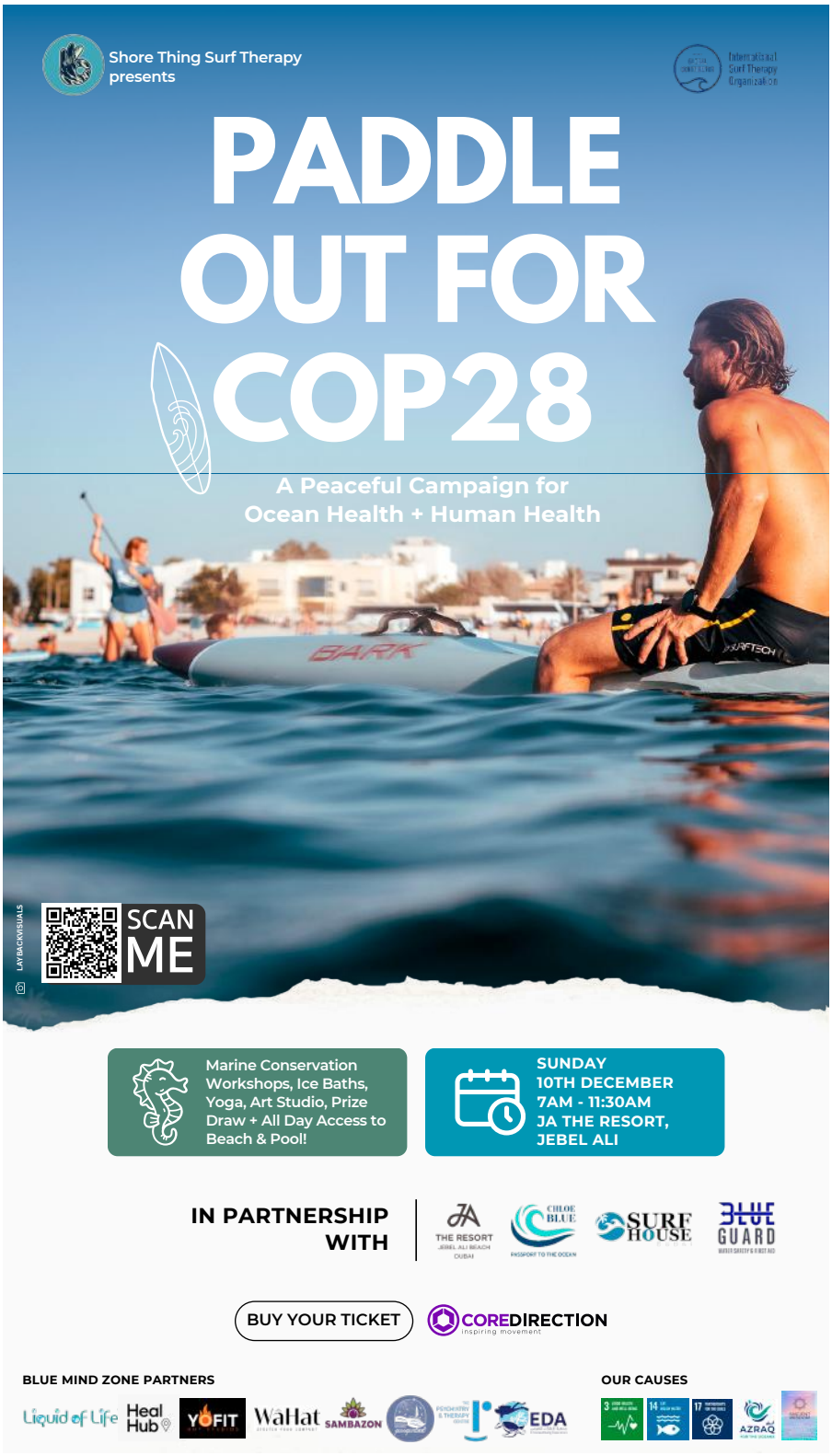
7am-11:30am
Paddle start time is 8:30am

TICKET CATEGORIES

WBYB (We Bring Your Board): AED 250
BYOB (Bring Your Own Board): AED 175
Spectator: AED 175
Kids: AED 75

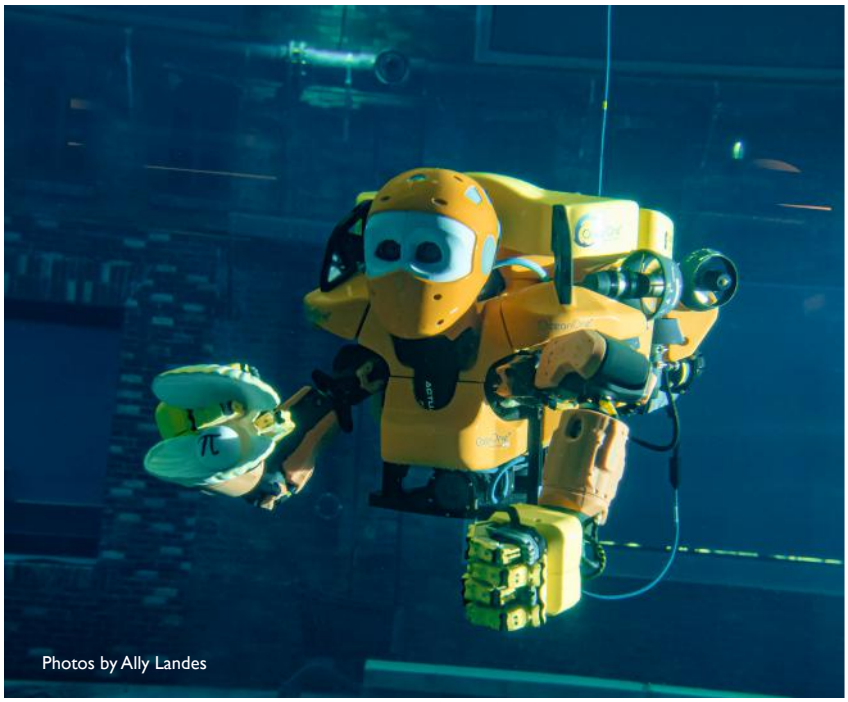
BLUE MIND ZONE

- All Day Beach + Pool Access to JA The Resort
- Emirates Diving Association
- Ice Baths – Heal Hub
- Yoga – YoFit Studios
- Marine Debris Workshop – Chloe Blue Diving
- Art Workshop – Studio Passepartout
- Educational Workshop – Azraq
- Pop-Up Clinic – Psychiatry & Therapy Centre
- Climate Café hosted by Climate Club
- F&B Samples + Snacks (Sambazon)
- Drinking Water – Liquid of Life
- Recycling by REE
- Entry to Prize Draw



DEEP DIVE DUBAI CELEBRATES INNOVATION

AND THE FUTURE OF UNDERWATER EXPLORATION WITH OCEANONE^{K}



Photos by Ally Landes

On the 27th of September, Deep Dive Dubai, owned by Shamal Holding, hosted a significant event featuring the groundbreaking OceanOne^{K}. The event, attended by distinguished VIP guests and media, showcased the remarkable collaboration between Deep Dive Dubai and Stanford University's Robotic Lab, led by Professor Oussama Khatib, the visionary behind the humanoid robot.

Deep Dive Dubai, the world's most unique diving experience, provided an unparalleled platform for the OceanOne^{K} Robot to exhibit its diverse capabilities, reflecting its unwavering commitment to pushing boundaries in underwater technology.

This event celebrated the profound connection between humans and the underwater world, exemplified by OceanOne^{K}'s seamless interaction with its surroundings. From playing billiards to treasure hunting, the robot's versatility is evidence to the limitless possibilities that lie beneath the surface.

Abdulla Binhabtoor, the Chief Portfolio Management Officer at Shamal Holding, said, "We are delighted to welcome Professor Oussama Khatib and his team to Deep Dive Dubai, providing a unique showcase of the future of underwater exploration. The collaboration between Stanford University's Robotic Lab and Deep Dive Dubai evokes Dubai's spirit of exploration, discovery and enjoyment. Shamal is proud to play an active role in positively contributing to Dubai's long-term ambitions, working with world-class partners to push the boundaries of innovation and technology as we continue to invest in the extraordinary, generating meaningful and sustainable returns."

"The OceanOne^{K}'s ability to seamlessly interact with its surroundings sets a new standard for underwater robotics and opens innovative paths for research and discovery. At Deep Dive Dubai, we firmly believe that diving is not just a sport, but a spirit of exploration that fuels our collective imagination. We encourage individuals to test their limits and plunge into new depths, both figuratively and literally. Our facility is a testament to this ethos, equipped with the latest cutting-edge technology, creating an environment where innovation thrives." added Jarrod Jablonski, director of Deep Dive Dubai.

The robot's haptic (touch-based) feedback system and stereoscopic vision produce incredibly realistic sensations like those a person would experience while diving underwater. That means that when an operator uses controls to direct OceanOne^{K}, the robot's haptic feedback system allows the person to physically feel the environment, including details like the contours of ancient artifacts.

The robot is an exceptional technological marvel, possessing the rare ability to see and explore through images, manipulate objects with its hands, and establish a connection with humans. These distinguishing features set it apart from other underwater robots on the global stage.

EDA's Project Director, Ally Landes asked, "Are there any environmental projects you are looking to get involved with here in the UAE?"

Professor Oussama Khatib responded with, "Well actually we designed this robot to help with the environment, to help with corals. Corals require intervention, we need to place sensors, and we need to take samples. When we went to explore the sunken Italian steamship Le Francesco Crispi, we found very rare and fragile corals there. We had to figure out how to take small samples without breaking them. Marine biologists are going crazy because they are down at 507 metres and you cannot safely get down there. But, imagine what we can do now.

We haven't done anything yet using the robot in the UAE, but we've started some collaborations. We are talking across the Emirates with different universities, groups and institutes to start helping not only in the natural environment, but also with artificial things we are installing in the world. We are not maintaining these structures we are building, and they are deteriorating.

I look at this robot and see we are going to allow humans to go beyond their limits. But at the same time, you're not only going to be seeing – you're going to be able to feel, and to touch."

Ally Landes also asked, "What was the deepest depth you've got OceanOne^{K} down to?"

"We went to 852 metres and hit the ground. We could go deeper. The design of the robot was for 1,000 metres. That's why we call it OceanOne^{k}. But this technology can take us down to 4,000 metres", said Professor Oussama Khatib.

FREEDIVING

A SINGLE BREATH CONNECTION TO MOTHER NATURE

BY **BASSEL OUNAH – APNEA ZONE DIVING & SNORKELLING CLUB**

Freediver, Arwa Eissa. Photo by Ovriel Navarro.

In the vast expanse of our planet, few environments are as mesmerising, mysterious, and fundamentally connected to the essence of life as our oceans. Beneath the shimmering blue surface lies a world full of wonder, beauty, and lessons about our existence. One of the purest and most intimate ways to connect with this underwater realm, is through freediving.

Unlike scuba diving, where you are burdened by tanks, regulators, and a constant stream of bubbles, freediving allows a silent and uninterrupted connection with the marine world. You submerge into the depths with a single breath, gliding effortlessly like any other sea creature. This minimalist approach, without barriers, fosters a profound bond with the environment.

Imagine the sensation: The world at the surface and its cacophony fades as you descend, replaced by the rhythmic beat of your heart and the gentle pressure of the surrounding water. With each metre, you dive deeper, the concerns of daily life seem more distant, and you become more present in the moment, fully immersed in the ocean's embrace.

This unique connection allows freedivers to have unparalleled interactions with marine life. Fish and other creatures are less likely to be spooked by a freediver's silent approach than by a scuba diver's noisy bubbles. It's a silent dance, a respectful invitation into their world.

Among the ocean's many wonders, perhaps none is as awe-inspiring as the mighty whale. These gentle giants, with their soulful eyes and playful demeanours, represent the majesty of the marine world. Encountering a whale whilst freediving is an experience that words can hardly capture. The sheer scale, the gentle grace with which they move, the melodic songs that can be felt as much as heard – it's an overwhelming emotional experience. It's a moment of mutual curiosity and respect, where two vastly different beings share a moment of connection in the ocean's vastness.

The intimacy of freediving provides an unparalleled perspective on the interconnectedness of life. You feel part of a larger ecosystem, a tiny yet significant piece in the intricate puzzle of nature. The delicate balance of marine ecosystems becomes palpably clear, underscoring the importance of protecting these precious environments.

In conclusion, freediving is not just a sport or a pastime; it's a journey into the heart of Mother Nature. It teaches humility, respect, and the importance of living harmoniously with our environment. Whether you're gliding alongside a playful pod of dolphins, marvelling at the vibrant colours of a coral reef, or locking eyes with a gentle whale, freediving offers a unique and deeply moving perspective on the wonders of our blue planet. It's a reminder that every breath we take is a gift, and the magic of the ocean is just a heartbeat away.

ONBOARD THE JAYWUN RESEARCH VESSEL

EAD SUCCESSFULLY COMPLETES THE FIRST-OF-ITS KIND ACOUSTIC SURVEY OF UAE WATERS

The Environment Agency – Abu Dhabi (EAD) announced that the most advanced research vessel in the region, Jaywun, has achieved a significant milestone by successfully completing the first phase of the Fisheries Resources Assessment Survey in the waters of the United Arab Emirates.

Moreover, the vessel also completed the first-ever comprehensive acoustic survey of the UAE's waters. This ground-breaking two-week study was conducted in the Arabian Gulf and the Sea of Oman and used advanced technology to examine underwater ecosystems and assess the population and distribution of marine life. The acoustic survey involves using sound waves to estimate the abundance and distribution of fish populations in the ocean. Through analysis we can determine the size, density, and location of fish schools, helping to assess the health and status of fish stocks and help us with sustainable fisheries management.

The vessel, manned by a team of EAD UAE nationals in collaboration with international experts, embarked on a remarkable 108-day sea voyage to conduct the survey, covering an impressive 324 sites across the UAE and gathering valuable data that will be used to evaluate and conserve the country's marine resources. As part of the project, nine UAE nationals were trained totalling 3,510 hours.

Over the course of the expedition, 1,500 samples were collected, enabling researchers to gain crucial insights into the region's fish species and their habitats. Additionally, in collaboration with G42 and OceanX, the research team accomplished the first eDNA (environmental DNA) baseline and genomic sequencing of fish species in the UAE's waters. This innovative approach offers a deeper understanding of genetic diversity, allowing for more precise conservation and management strategies in the future.

Ahmed Al Hashmi, Executive Director of the Terrestrial and Marine Biodiversity Sector at EAD, said, "The successful completion of the first phase of the Fisheries Resources Assessment Survey marks a significant milestone for the UAE's ongoing efforts to safeguard its marine environment. The invaluable data collected by the research vessel Jaywun and its dedicated team of UAE nationals will contribute to informed decision-making and sustainable management of the country's fisheries resources. We have worked very hard over the past few years to increase our fish stocks as this is vital for food security and the conservation of our fish species."

He added, "This is the first time an acoustic survey has been conducted in all of the UAE's waters and it will help us get a much clearer and accurate picture of marine life in the Arabian Gulf and Sea of Oman. We developed Jaywun for the purpose of marine water research and these are the first of several other research projects which will be conducted onboard the vessel."

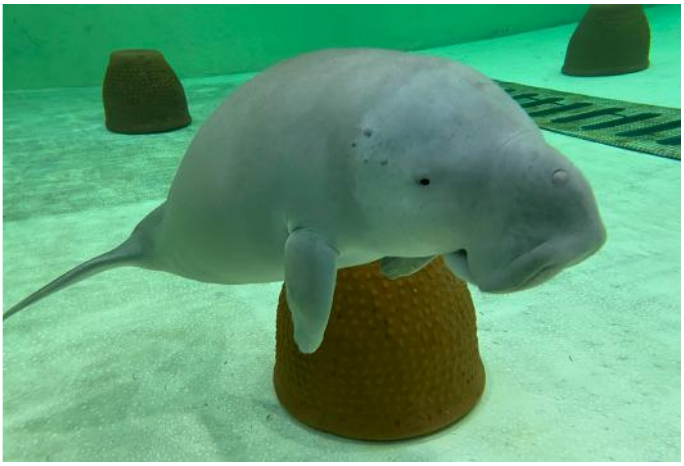
Under the patronage of His Highness Sheikh Hamdan bin Zayed Al Nahyan, Ruler's Representative in Al Dhafra Region and Chairman of EAD, the Agency commissioned Jaywun – the Middle East's most advanced research vessel. The 50 metre, state-of-the-art multipurpose marine conservation and fisheries vessel uses environment-friendly technologies to conduct specialised research in the Arabian Gulf – the world's hottest sea and a natural climate change laboratory – as part of the UAE's forward-looking science and innovation-based initiatives.

Jaywun is the most advanced research vessel in the region, with scientific equipment that includes: a remotely operated vehicle; trawling and trapping kit; seabed mapping and acoustics; CTD (conductivity, temperature, and depth sensing device); and scuba-diving facilities. The vessel also houses six laboratories: a fisheries laboratory; an acoustic laboratory; a chemical analysis laboratory; a bio-physical laboratory; a wet laboratory, and is also set up to operate an air quality laboratory. With its high fuel efficiency and hydrodynamic performance that allows for less drag when sailing, Jaywun consumes less fuel and energy than other similarly sized vessels. It also reduces the amount of carbon dioxide emissions into the atmosphere, which supports the UAE's goals in addressing climate change.

The Agency has various research campaigns planned. These include: oceanic fisheries blue carbon assessments; climate change research; deep water habitat mapping and surveys (coral and seagrass); deep water megafauna surveys – including cetaceans, dugong, turtle, whale sharks – as well as invasive marine species surveys; marine water quality; air quality; plastics; and underwater heritage – which includes shipwrecks and pearl diving beds.

In addition, Jaywun will be supporting the UAE's 'climate neutrality by 2050' goal by conducting research into oceanic blue carbon, a globally important initiative. Oceanic blue carbon includes the carbon stored through the actions of marine life, from krill to fish, sea turtles, and marine mammals. Understanding how marine vertebrates contribute towards carbon storage helps to recognise their potential role in climate change mitigation.

AFTER SUCCESSFUL REHABILITATION BY EAD & PARTNERS,
MALQUOT TRANSFERRED SAFELY TO THE YAS SEAWORLD® RESEARCH & RESCUE CENTRE



The Environment Agency – Abu Dhabi's (EAD) specialised marine species team, supported by experts from the Conservation of Migratory Species of Wild Animals (CMS) Regional Office and Worldwide Zoo Consultants (WZC), successfully rescued and rehabilitated a dugong calf named Malquot. Found abandoned in Marawah Marine Biosphere Reserve in poor health, he was transferred to a specialised facility and provided with 24-hour care until he was fully rehabilitated and healthy.

The Agency was able to successfully rear and rehabilitate Malquot with the support of key stakeholders, including veterinarians and animal care staff vets from Worldwide Zoo Consultants. After years of care by the dedicated team since his rescue in 2019, Malquot has now been successfully transferred to rescue facilities at the Yas SeaWorld Research & Rescue Centre – where he can continue his life under human supervision. This is because he lacks the natural survival instinct acquired in the early stages of a dugong's life, and life in secure facilities won't expose him to life-threatening risks.

As Malquot has been reared in a controlled environment, he has not developed normal immunity and has adapted to receiving specialist human care, which hinders his ability to interact with other species and avoid predators. According to information from an MoU by the Secretariat of the Conservation and Management of Dugongs and previous attempts made around the world, no dugong to date successfully rehabilitated in captivity has been released back into its natural environment. Therefore, EAD and its partners are working to continuously monitor the condition of Malquot to ensure that he receives the best possible care.

The Agency, through its team of experts, will be overseeing Malquot's progress at the Yas SeaWorld Research & Rescue Centre, and closely following up on health checks, behaviour and his overall acclimatisation to his new home at SeaWorld Yas Island, Abu Dhabi. SeaWorld Yas Island, Abu Dhabi will provide a dedicated team of animal care specialists that will attend to his every need and the EAD team of marine animal specialists will be on call to ensure he remains healthy.

Malquot was transported to Yas Island in Abu Dhabi in a specially outfitted Marine Wildlife Rescue Vehicle. This temperature-controlled unit was designed for moving any large or small marine animal in need of assistance. The vehicle allowed for veterinarians and animal care specialists to ride alongside Malquot the entire journey to monitor his vital statistics and mist his body with water.

Ahmed Al Hashmi, Executive Director of the Terrestrial and Marine Biodiversity Sector at EAD, said, "Ever since Malquot was rescued, and in collaboration with our partners, we have always ensured that he is well taken care of at all times. He has been assigned a dedicated team of scientists who have monitored his progress as he returned to good health. He will provide veterinarians, animal nutrition specialists, and animal care specialists the opportunity to better learn the needs and behaviours of such an enigmatic species."

He added, "As there have been very few successful dugong rehabilitations around the world, Malquot will give both resident and visiting scientists the opportunity to study how he interacts with his environment and how he develops as he grows and reaches maturity. The incredible work that has been done during Malquot's critical early rescue and rehabilitation period has set him up to settle in well at the Yas SeaWorld Research & Rescue Centre in Abu Dhabi."

Rob Yordi, General Curator at SeaWorld Abu Dhabi and the Yas SeaWorld Research & Rescue Centre, said, "Malquot's journey has been a testament to the dedication and collaborative efforts of all organisations involved in preserving the well-being of our indigenous marine life. We at the Yas SeaWorld Research & Rescue Centre and SeaWorld Yas Island, Abu Dhabi are immensely proud to provide a new home for Malquot. As he continues to thrive in his new surroundings, his presence will serve as a valuable source of scientific knowledge to enhance our understanding of this species. This understanding is pivotal for the continued conservation efforts of dugongs across our region."

He has grown from a newborn neonate of less than one month old to a five year-old male juvenile. Due to being rescued at such a young age Malquot would not be able to survive on his own out in the Arabian Gulf. The Yas SeaWorld Research & Rescue Centre and SeaWorld Yas Island, Abu Dhabi are the best equipped facilities for him given the space, the medical facilities, care and equipment available. He will also have caregivers and around-the-clock veterinary support, which makes the Centre the ideal facility to host him for the time being.

There are approximately 3,000 dugongs in the territorial waters of Abu Dhabi, mostly found near Bu Tinah Island, which forms part of the Marawah Biosphere Reserve and Al Yasat Marine Protected Area. The Arabian Gulf is home to the second-largest gathering of dugongs in the world, after Australia.

The largest dedicated marine research, rescue, rehabilitation and return centre in the region, the Yas SeaWorld Research & Rescue Centre serves as an integrated and advanced marine science knowledge hub and a key contributor to marine life conservation in the UAE and the wider region.

EAD and Yas SeaWorld Research & Rescue are entrusted to help any marine animal in need or at risk. Members of the public are encouraged to call the Environment Agency – Abu Dhabi (EAD) via the Abu Dhabi Government Call Centre 800 555 to report any animals who may be injured or in danger.

EAD ANNOUNCES THE "GHARS AL EMARAT"
WHICH WILL PLANT MANGROVE TREES FOR EACH VISITOR TO COP28

Under the patronage of HH Sheikh Hamdan bin Zayed Al Nahyan, Ruler's Representative in Al Dhafra Region and Chairman of the Board of Directors of the Environment Agency – Abu Dhabi (EAD), and within the framework of the Abu Dhabi Climate Change Strategy and Abu Dhabi Mangrove Initiative and the UAE's hosting of the 28th Conference of the Parties to the UN Framework Convention on Climate Change (COP28) – held from 30 November-12 December 2023 in Expo City, Dubai, EAD announced the launch of "Ghars Al Emarat" (UAE Planting Initiative) that will see 10 mangrove trees planted for each conference visitor.

Through the initiative, which coincides with the Year of Sustainability, mangroves will be planted using innovative methods such as drone dispersal, and approximately 10 mangroves will be planted for each visitor participating in the conference. Mangroves will be planted during the last quarter of this year, which is the best time for planting this species, within the most suitable coastal environments for growth, such as the Marawah Marine Biosphere Reserve, Al Mirfa City and Jubail Island where natural mangroves already exist.

This initiative also supports the goals of the Abu Dhabi Mangrove Initiative, which was launched in February 2022 during the meeting that brought together HH Sheikh Khalid bin Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Chairman of the Executive Council, and His Royal Highness William, Prince of Wales, at Jubail Mangrove Park in Abu Dhabi. The initiative provides a platform for the development of innovative solutions for conserving and restoring mangroves, helps mitigate the effects of climate change, and raises awareness of their importance and the need to restore them, while strengthening the emirate's position as a leading global research and innovation centre in mangrove conservation.

Her Excellency Dr Shaikha Salem Al Dhaheri, Secretary General of EAD, said, "This initiative aims to support Goal 13 of the United Nations Sustainable Development Goals related to 'climate action', which calls for urgent measures to be taken to address climate change and its impacts. It also supports national initiatives including the UAE Net Zero by 2050 climate neutrality strategic initiative, which aligns with the UAE's goal of planting 100 million mangroves by 2030."

"This initiative also highlights the UAE's commitment to achieving climate neutrality and promoting nature-based solutions to reduce the effects and adapt to climate change and reduce the environmental footprint of conference visitors, at the rate of absorbing one tonne of carbon for every 5,000 mangrove trees," Her Excellency Dr Shaikha added.

Her Excellency Razan Al Mubarak, UN Climate Change High-Level Champion for COP28, said, "Building a resilient, net-zero future depends on halting nature loss and restoring our natural ecosystems. Nature-based solutions, including those involving mangroves, have the potential to supply over a third of our climate mitigation needs and build resilience to the effects of climate change. I welcome this EAD-led initiative which both raises awareness and takes action to restore and protect mangroves in the UAE."

Mangroves are amongst the most productive coastal ecosystems in the world and are therefore extremely important as they provide a variety of ecological and economic services. Mangroves help mitigate the effects of climate change, as they absorb greenhouse gases and can store and sequester carbon.

In Abu Dhabi, the trees support a wide range of biodiversity that live in them. Mangroves also play an important role in protecting neighbouring habitats such as seagrass beds and coral reefs from sedimentation, as well as helping to improve water quality and supporting ecotourism activities.

Abu Dhabi hosts 85 per cent of the United Arab Emirates' mangroves, and as part of its strategy, the Agency is working to study and preserve these important coastal habitats. Thanks to mangrove rehabilitation projects, Abu Dhabi has witnessed an increase in the size of its mangrove areas. Efforts to restore mangroves in the UAE date back to the 1970s, when the late Sheikh Zayed launched extensive afforestation programmes to plant mangroves on the country's beaches.

Since its inception, EAD has continued Sheikh Zayed's efforts via a range of afforestation programmes in cooperation with its concerned partners, which include the planting of 40 million mangroves since restoration efforts began, on islands and in various regions, including Saadiyat, Jubail, Yas, Hudayriat, Abu Al-Abyad and Al Dhanna.

These programmes have helped increase mangrove areas by 64 square kilometres. In line with the application of strict protection laws, the amount of Abu Dhabi's mangroves has increased by more than 35 per cent, and, today, the emirate's total mangrove area is 176 square kilometres, including natural and cultivated trees.

The Agency launched the Abu Dhabi Blue Carbon Demonstration Project, which studied the importance of mangroves and their role in combating climate change, through carbon sequestration, and the importance of blue carbon habitats and ecosystems. The results revealed that mangrove ecosystems in Abu Dhabi contain 98 tonnes of carbon per hectare. This is equivalent to 1.7 million tonnes for a mangrove area of 17,500 hectares in Abu Dhabi.

In 2020, the "Mangrove Carbon Sequestration Pilot Study" was carried out to assess soil carbon sequestration rates in mangrove forests, which revealed their ability to store carbon at a rate of 0.5 tons per hectare per year. This is equivalent to 8,750 tonnes in Abu Dhabi per year – the annual equivalent to the energy consumption of 1,000 homes.

ABU DHABI HOSTS THE LARGEST REPORTED OSPREY BREEDING POPULATION IN THE ARABIAN GULF REGION

The Environment Agency – Abu Dhabi (EAD) conducted a survey across the emirate of Abu Dhabi in 2023 to monitor the breeding populations of the Osprey – the largest in the Arabian Gulf region. Covering all coastal sites, in addition to the islands near the coast and the sea of Abu Dhabi, the survey to monitor Osprey breeding was the most comprehensive ever conducted in the UAE, with 127 breeding pairs recorded across more than 40 coastal and island locations.

To help maintain the stability and reproduction of the Osprey population, EAD cooperated with strategic partners to provide artificial nesting platforms at certain sites and on islands connected to the mainland to protect them from predation and human interventions. The nesting platforms provided suitable and safe options for birds to build new nests.

Ahmed Al Hashemi, Executive Director of the Terrestrial and Marine Biodiversity Sector at EAD, said, "The Agency has taken measures to monitor and protect this important species, including providing artificial nesting platforms that have been placed in more than 25 locations. These have proven to be a very effective tool in providing breeding opportunities. We are taking actions as outlined in the action plan for the species which has been classified as Endangered (EN) in the Abu Dhabi Red List of Species.

He added that the comprehensive survey and regular monitoring of the breeding population will provide the Agency with the information on the Osprey to assess trends in numbers and enhance efforts to protect and preserve the birds. Fifty-six percent of the Osprey nests are present in EAD's marine nature reserves, which enhances the Agency's role in protecting and preserving the environment.

The Western Osprey (*Pandion haliaetus*), known locally as "Dammi", is a breeding bird species native to the United Arab Emirates. It feeds exclusively on fish and is widespread in marine habitats only, with very few nesting inland. Ospreys breed in the UAE from December to March, and usually nest on the ground in huge nests made up of dry vegetation surrounding the nesting site. Each breeding pair builds one or more large nests using the dry twigs found on these islands. Nests are also built on rocky outcrop, abandoned structures, or any raised platform large enough to accommodate them. They can nest on very high structures as one of the highest nests was recorded at a height of about 60 metres on a communications tower. The survey revealed an unusual observation, as the nest of the Osprey was built in a tree – uncharacteristic behaviour as this species prefers to nest on the ground.

Ospreys typically select a single nest to breed, which they may consistently reuse every year. The Osprey feeds only on fish, which is why it prefers to nest in coastal areas, close to abundant supplies.

The Osprey is protected under Federal Law No. 24/1999 which prohibits hunting, killing or capturing these birds, collecting their eggs or hatchlings, or causing damage to their breeding sites. The Agency is committed to monitoring and enforcing protection measures to ensure the preservation of this important bird species and its natural habitats.

Ospreys are considered a good indicator of the health and quality of the marine ecosystems. The species is included within the Action Plan to conserve migratory birds of Prey under the Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia (Raptor MoU). The Agency works closely to conserve this species at a global level in cooperation with the Secretariat of the Convention on Migratory Species and hosted and supported the CMS Abu Dhabi Office since 2009 which implements programmes and activities for Conservation of Migratory Birds of Prey in Africa and Eurasia under the Raptor MoU.

EAD'S MARINE RESEARCH VESSEL "JAYWUN" RECEIVES THE FUTURE FIT SEAL

The Environment Agency – Abu Dhabi's (EAD) marine research vessel "Jaywun" – considered the first of its kind in the UAE and the most advanced in the Middle East – received the Future Fit Seal, awarded to federal and local entities for designing clear, targeted, practical, exceptional projects to enhance the UAE's readiness for the future.

Inaugurated in January 2023 by His Highness Sheikh Hamdan bin Zayed Al Nahyan, Ruler's Representative in the Al Dhafra Region of Abu Dhabi and Chairman of EAD, "Jaywun" supports the UAE's efforts in the field of marine sciences. It does this by addressing the impact of climate change and conducting comprehensive monitoring and assessment of the marine ecosystem to achieve EAD's mission of managing marine biodiversity, and providing a reliable scientific platform that caters for the needs of marine research in the UAE.

Her Excellency Ohood bint Khalfan Al Roumi, Minister of State for Government Development and the Future, visited the marine research vessel "Jaywun", where she was received by Her Excellency Razan Khalifa Al Mubarak, Managing Director of EAD, and Her Excellency Dr Shaikha Salem Al Dhaheri, Secretary General of EAD.

Her Excellency Al Roumi highlighted that "Jaywun" is one of the prominent projects that supports the UAE's readiness for the future. The advanced data and research it provides will contribute to increasing marine biodiversity, achieving the UAE Net Zero by 2050 strategic initiative, and developing sustainable government policies and programmes to address the impact of climate change.

"The Future Fit Seal highlights the achievements of government entities that design impactful projects to enhance the UAE's readiness for the future, achieve proactiveness and sustainability in a rapidly changing world, and help leverage future opportunities to promote the UAE's competitiveness," Her Excellency Al Roumi added.

Her Excellency Dr Shaikha Salem Al Dhaheri, Secretary General of the Environment Agency – Abu Dhabi stated that, "EAD's research vessel "Jaywun" asserts the keenness of Abu Dhabi's leadership to support the scientific approach adopted by EAD in order to enhance the sustainable management of the marine ecosystem, especially in the oceans, and become one of the leaders in scientific research using the most innovative tools and equipment."

"This new, innovative research vessel will contribute to maintaining our leadership in the field of scientific marine research and sustainable fisheries management, which is one of our key strategic priorities and success stories," HE added.

Al Dhaheri elaborated further, "Using the latest technologies and ensuring that all equipment and protocols on the vessel are environmentally friendly, we position Abu Dhabi as a leader in the environmental and sustainability scientific research in the region. Moreover, our methodology for reviving our fish reserves can serve as a benchmark for fisheries studies internationally. The EAD's future vision for preserving fisheries, ensuring their recovery, and monitoring them through this research vessel is a testimony of our marine ecosystem sustainability commitment. The research vessel is one of the main projects in shaping the future of the marine ecosystem, employing scientific research to sustainably manage fish resources, curb the impact of climate change and ensure the sustainability of resources for present and future generations."

"Jaywun" monitors fish reserves and marine biodiversity, in addition to its efforts to enhance the passion of young Emirati researchers in a career conducting research and studies on fisheries in the hottest sea in the world, the Arabian Gulf. It further supports the implementation of a number of environmental initiatives, most important of which is the Blue Carbon Assessment Project for Ocean Fisheries. This is the first survey conducted to assess ocean blue carbon across fisheries in the region. The vessel will also help map the DNA baseline for the UAE's main fish species by studying the genome sequences of more than ten major fish species. The survey utilises both marine species collection methods and subsea sound wave techniques.

The project includes a comprehensive survey for following up on the UAE fisheries during 2023, as well as studying fish reserves and marine resources to update data related to their condition. The comprehensive fisheries assessment survey is extremely important at both the national and regional levels, as it provides a clear image of the condition and trends of fisheries in the UAE and contributes to adopting the necessary measures for their sustainability, development and recovery. With around 30 personnel working on board, "Jaywun" has cutting-edge research equipment and encompasses 6 laboratories for studying samples on the vessel, and a remotely-operated vehicle that has the ability to dive underwater.

THE FUTURE FIT SEAL

Future Fit projects are assessed by the Government Development and Future Office based on six key criteria, namely; the project should focus on human-centred approaches and utilise emerging trends and data to design future readiness projects, the project's ability to create added value for the national economy and the society of the United Arab Emirates, the extent to which the project adheres to sustainable practices and utilises advanced technology to create a better future, the project should be proactive, innovative, and practical, contributing to enhancing future readiness, achieving flexibility and the ability to adapt to future changes, and achieving digital readiness through the adoption and development of advanced future technologies.

TULA BLUE'S WATERPROOF JEWELLERY COLLECTION FOR THE ADVENTURE-SEEKER CREATED BY PADI SCUBA DIVER

The Tula Blue "Celestial Waves Bracelet Stack" includes Peruvian Turquoise 8mm bracelet, White Pearl Riptide Bracelet, Larimar Riptide Bracelet, Blush Medium Rice Bracelet. Priced at around AED680.

PADI Scuba Diver, Heather Stringer, is the Founder and creative force behind Tula Blue, a jewellery collection designed to be worn by adventurers from sea to summit.

Tula Blue's innovative waterproof jewellery collection allows individuals to enjoy their favourite pieces during any adventure, even underwater exploration.

Tula Blue's distinctiveness lies in its ability to be worn throughout life's adventures without ever needing to be removed. Whether you are diving, swimming, travelling, working out, hiking, surfing, showering, or even sleeping, Tula Blue jewellery is up to the challenge.

Handcrafted by skilled artisans with freshwater pearls and genuine stones, Tula Blue's minimalist collection will take you seamlessly from workday to an evening out.

What sets Tula Blue apart is its use of eco-friendly materials and sustainably sourced shells, freshwater pearls, crystals, and semi-precious stones, aligning with PADI's commitment to preserving the beauty of our oceans. Every piece of Tula Blue is strung on their signature rope, a nautical-grade, 100% hand-spun rope that is not only waterproof but incredibly durable – ideal for a salty sea dip.

Naturally beautiful, endless combinations of necklace, bracelet, and anklet stacks allow your unique personality to shine. Made to move with you wherever you go, their rope has been spun up with strength, endurance and the goal of tying kindred souls together for positive vibes only!

Heather Stringer, the creative force behind Tula Blue, tells us, "Tula Blue will look great and make you feel great no matter where in the world you are – whether that is diving into the ocean, scaling mountain peaks, shredding waves, swimming in the sea, hiking in the forest, or seeking out places waiting to be discovered. Tula Blue is designed to help you make a fashion statement doing anything you adore and will be something that you can always wear while doing what you love."

"One of the standout pieces for ocean adventurers is the "Celestial Waves Bracelet Stack." This exquisite stack of gemstone bracelets includes Peruvian Turquoise, White Pearl, Larimar, and Blush, each with unique properties that bring balance, calmness, stimulation, and inner radiance. This bracelet stack is designed to make you feel beautiful, bold and fearless, whether you're a scuba diver, surfer, freediver, or a mermaid. It's an embodiment of the limitless possibilities that await when you connect with the ocean."

PADI Club Members receive 15% off their purchase, with 5% of the cost then going straight towards PADI AWARE.
www.tulablueropes.com

PADI'S CHRISTMAS GIFT GUIDE: GIVE THE GIFT OF BLUE
MEANINGFUL GIFTING FROM AND FOR OCEAN LOVERS

This year, you can make your holiday giving count while still delighting the ocean lovers, wanderlusters, wishful mermaids and thrill seekers on your list. PADI, the world's largest purpose-driven diving organisation, has curated the ultimate, swoon-worthy holiday gift guide for those who adore the ocean and want to protect our largest – and most important - ecosystem.

Whether it's sustainable gear made from recycled plastic perfect for the beachgoer, the ultimate, limited-edition collectibles for shark lovers, a passport to explore the secrets hidden beneath the surface in far flung places, or the chance to swim with dolphins as a mermaid, share in the power of creating positive ocean change through purpose-driven gifting while delighting everyone on your list.

Here are PADI's top picks for holiday gifts that pay it forward and serve a higher purpose:

1. THE GIFT OF THE FIRST BREATH UNDERWATER

Photo by Neil Andrea and Julie Andersen.

Ask anyone about their first dive and they'll share how unforgettable it was to dip their heads beneath the surface and breathe underwater for the first time. For many, it creates an instant lifelong passion for both exploring and protecting our blue planet. Do you know someone who is curious about scuba diving but has never tried it? Let them test the waters with PADI's Discover Scuba Diving course. It's a fantastic way to learn all about diving and give someone their first experience in the deep blue if they're thinking about getting their full PADI Certification.

The experience will introduce them to the basics like how to use scuba gear and what hand signs to use to communicate with others underwater while under the guidance of a trained PADI Instructor. This experience will take place either in a pool or a calm water environment. Your adventure can start all over the globe, in one of PADI's 6,600 members' locations. Whether you choose to gift this locally, or on your next vacation in paradise, it's easy to change someone's life forever.

It's the perfect gift to give the whole family – it's an amazing way to bond and something you'll all remember forever. Kids as young as 10 can join in on the fun. Why not try something you can all enjoy for years to come together – and see if your family has the adventure gene?

2. THE GIFT OF A PASSPORT TO A LIFETIME OF ADVENTURE

Photo by Neil Andrea and Julie Andersen.

Buy less, do more. It's the perfect motto in a world full of materialism. Rather than giving another gift that could end up in a closet collecting dust, you can give the ultimate experience – the ability to experience the incredible world underwater as a scuba diver, free diver, mermaid (see #1!) or snorkeller and forever change their life.

PADI's library of diverse educational courses provide transformational opportunities and a life-long passport to seeking adventure beneath the surface. What's more, your recipient will earn a certification to turn your passion into meaningful action to protect our blue planet.

With courses available for all ages and skill levels, certifications can be completed in 28 languages. And they can start from home with PADI eLearning – the foundation to obtaining any certification – which can be completed online or offline. From there, your recipient can complete the course with one of 128,000 PADI Professionals located around the world.

For the adventurer in your life who wants to explore worlds that are still waiting to be discovered, for the bucket lister who has always wanted to swim with a turtle, and for the budding underwater detective eager to check out the mysteries of the deep, the PADI Open Water Diver course is the perfect gift. It's the first level of PADI Certification that teaches all the skills and knowledge someone will need to dive at home or anywhere in the world. The course covers everything from basic principles and terminology to practical skills that include five dives in the open water with your PADI Instructor. Designed for beginners, kids as young as 10 years old can get their PADI Certification too as PADI Junior Open Water Divers – so it is also the perfect present for the whole family! The course can begin at home with PADI's eLearning, and then be completed at any of PADI's 6,600+ Dive Centres and Resorts around the world.

If someone is already certified with PADI, help them go deeper into their underwater journey by choosing from a range of PADI's Continuing Education courses. This includes a variety of specialised skills like advanced open water diving, wreck diving, night diving, or underwater photography. For those that want to take action to protect the ocean, there are also a range of conservation courses that provide the knowledge to help them protect the underwater world they love. Top picks include:

PADI AWARE Speciality: A gift that makes a difference for our shared blue planet, by helping anyone and everyone learn and apply tips to save the ocean. The PADI AWARE Speciality course equips you with tangible actions and opportunities to bring about positive ocean change. Supported by PADI eLearning®, this course dismantles the barriers between diving and conservation, making responsible marine conservation accessible to all. A portion of the proceeds from every PADI AWARE Foundation™ course funds AWARE's critical conservation work to remove marine debris, secure protection for sharks & rays, expand marine protected areas, and support local grantees.

3. THE GIFT OF A TRIP THAT MAKES A DIFFERENCE

Photo by Neil Andrea and Julie Andersen.

Wrap the world up with a bow with the gift of travel that gives back to our blue planet at the same time. Curated to help travellers discover new depths of our shared blue planet, PADI's global travel platform offers bucket-list adventures with the largest collection of liveaboards and dive resorts.

Fuelling wanderlust souls, enriching families, connecting visitors with local communities and supporting thoughtful holiday itineraries, PADI takes travel to a new level of purpose – and sustainability.

PADI Travel offers once-in-a-lifetime holidays that empower destinations, protects marine life and teaches travellers how to create ocean change. Book a trip from a selection of hundreds of dive destinations, and thousands of dive holiday packages.

Delve deeper into purpose-led gift-giving by choosing a PADI Eco-Resort that champions sustainable practices. These incredible destinations are designed to cultivate environmental awareness by empowering both visitors and locals to protect marine life around the world. You can also check out PADI's Green Fins Partners to gift a sustainable dive trip that's committed to the UN Conservation Programme World Reef Foundation's mission to protect and conserve coral reefs.

You can even mitigate the footprint of a gifted trip too by opting to plant seagrass to offset your carbon, supporting mangrove habitat restoration, and ensuring the trip will have a positive impact on the planet.

4. GIVE THE GIFT OF SAVING THE OCEAN

Photo by Neil Andrea and Julie Andersen.

Know someone who doesn't want any more "stuff"? Why not give them the gift of being able to help create positive ocean change!

Donate to the PADI AWARE Foundation in their name so they're part of something bigger – and bluer. The global non-profit foundation's mission is to drive local action with a global impact on ocean conservation. For over three decades, PADI Aware Foundation has helped secure international protection policies for vulnerable species, contributed to ground-breaking science on marine debris, and created an underwater citizen science movement around the world that mobilises divers and lovers of our shared blue planet to make a difference. Donations fuel conservation programmes that include saving sharks and rays, regenerating coral reefs, creating more marine protected areas, and cleaning the ocean of marine debris.

5. THE GIFT OF A DIVE BUDDY – MEMBERSHIP TO PADI CLUB!

Give the gift of endless dive education and a new dive buddy in the process by gifting a PADI Club Membership. They will get 20% Off select PADI eLearning® programmes, Free ReActivate® online scuba refresher course, 25% Off a new Certification Card, subscription to Scuba Diving magazine + more! The gift also has a bigger purpose, as their membership benefits the ocean, with 5% of the membership fee going directly to the PADI AWARE Foundation

6. GIFTS INSPIRED BY PADI DIVERS:

Stocking Stuffers for Water Lovers that Do Good for the Planet

STREAM TO SEA – Only Mineral Base Sunscreen Proven Safe for the Ocean

Founded in 2014 after Autumn Blum, a PADI Instructor and cosmetic chemist, set out to create an ocean friendly collection of sunscreens, lotions and conditioners after she went diving in Palau and saw a chemical sheen coming off a group of snorkellers. Knowing the ingredients in chemical sunscreens could be very harmful to not just our bodies, but also to our fragile aquatic ecosystem, she knew we could do better. Today, Stream2Sea has the only mineral-based sunscreen on the planet that's been tested and proven safe for freshwater fish, saltwater fish, and coral larvae, and has passed the stringent HEL Labs Protect Land + Sea certification. All products in the Stream2Sea line are consciously formulated by Autumn to be safe for you, and safe for our blue planet.

TULA BLUE – Ultimate Jewellery Collection for Water Lovers + Adventure Seekers

PADI Scuba Diver Heather Stringer created Tula Blue to be a jewellery collection for those seeking out a balanced life. Crafted on nautical twine spun by hand, Tula Blue is waterproof, kid-proof, and life-proof. What started out on a dining room table in 2014, has grown into a tribe of women (mostly busy mums) working out of two workshops in Corpus Christi and Austin, Texas. Each piece of Tula Blue is designed to be worn for the ultimate adventure – including exploring the depths of the ocean.

PS: PADI Club Members receive 15% Off their purchase, with 5% of the cost then going straight towards PADI AWARE.

NEURO – Providing Energy, Calmness and Vitality for Ocean Exploration

PADI Open Water Scuba Divers Ryan Chen and Kent Yoshimura experienced first-hand the entrepreneurial side-effects of scuba diving. During one of their dive trips, the two founders of Neuro came up with their business idea to create functional gum and mints that fuel the mind and body. Since then, they've received offers on Shark Tank and Ryan has been named to Forbes 30 under 30. Neuro is the perfect addition to any dive bag for those planning to seek out adventures beneath the surface.

PS: They are teaming up with PADI to create a special tin collection that supports creating positive ocean change in 2024!

OCEANSHOT INVITES PADI TO FIRST-EVER UNDERWATER PANEL

PADI Pros train with OceanShot partners for underwater coral reef panel at the Global Citizen Forum at COP28

PADI® is joining OceanShot co-founders for the historic underwater panel on positive ocean change at the Global Citizen Forum, which is taking place alongside COP28 in Ras Al Khaimah, UAE December 6-7 2023. The first-of-its-kind underwater panel will dive deep on the importance for coral reef protection to elevate the urgent need for ocean action.

PADI's CEO and President Drew Richardson will join Dr Brosnan and Mr DeJoria at the Global Citizen Forum's first-ever underwater panel to purposefully descend beneath the surface in the hopes of calling people around the globe to positive ocean action and inspiring them to both explore and save the ocean.

OceanShot is a coral reef ecosystem restoration project co-founded by globally-recognised marine scientist and climate risk expert Dr Deborah Brosnan, and global philanthropist, environmentalist and entrepreneur John Paul DeJoria, launched in partnership with the Government of Antigua and Barbuda. The initiative uses technology that mimics the design and shape of natural reefs to restore coral and invite back marine life, as well as protect nearby coastal communities from storm surge and sea level rise.

Dr Richardson is one of the most influential people in scuba diving and has transformed PADI's mission to create a billion ocean Torchbearers™ who are taking local action for global impact and united by a shared vision to achieve balance between humanity and the ocean.

OceanShot's first living-lab hub, designed to be a place where innovators can test their technologies aimed at environmental protection, was deployed in Antigua and Barbuda. In June 2021, the Global Citizen Forum adopted OceanShot as one of its supported flagship initiatives. This year, OceanShot's co-founders invited PADI as a partner in its world-class restoration model.

"Coral reefs are among the most ecologically and economically valuable ecosystems that drive our blue economy," says Dr Richardson. "Scuba divers can not only explore beneath the surface and fuel ocean change as Torchbearers, taking part in a range of meaningful diver citizen-science actions driving real results. As global citizens, we have the opportunity to be changemakers that inspire more innovative and positive solutions for the health of coral reefs, the ocean and our shared blue planet."

"We're doing this work because our oceans need us and we need them," says Dr Brosnan. "Humans have mapped the human genome, landed astronauts on the moon, and in less than twelve months, developed a viable vaccine to combat a global pandemic. It is time to focus the same attention on our oceans with bold, ambitious, and achievable initiatives."

PADI recently conducted a special underwater training session with Dr Richardson, Dr Brosnan and Mr DeJoria in preparation for the upcoming underwater panel in December where they will share their knowledge and passion for ocean conservation with the world.

To learn more about the first underwater panel at the Global Citizen Forum visit: **www.globalcitizenforum.org/ocean-shot/**

OceanShot is managed and operated by Dr Deborah Brosnan. For more information, visit: **www.deborahbrosnan.com/oceanshot.html**

STEPPING INTO THE BLUE WORLD!

BY **OM KISHAN MANOJ** (ADVANCED OPEN WATER DIVER)

Om experiencing his first breath underwater during his Discover Scuba Diving course.

When you open your eyes underwater, you see the colour of bright blue, and when you look around, you see the rainbow hued marine life. This was my experience in a nutshell when I had been given the opportunity to witness the underwater world for the first time. This world which is largely unseen by us land dwellers, is quite mesmerising!

It all started in early July of 2021 when I was in the Maldives for my summer vacation. While taking a stroll amongst the lush palm trees, my dad and I stumbled across a dive centre. Since I didn't have anything planned for my week there, I decided to try a DSD (Discover Scuba Dive). I was told I would meet my instructor the next day, and she would teach me the basics and then take me for my first dive at their house reef.

I went to the dive centre the following morning unaware of what lay ahead of me, greeted by my instructor, Queenie. She was a cheerful lady with a sweet smile on her face – she was also very patient. She started teaching me the basic hand signals which would later become our only form of communication underwater. Once the briefing was over, I got ready with my dive kit and went for my first ever dive.

I soon saw myself staring at one of the most incredible sights I had ever seen in my life. When I looked around, I saw gardens of beautiful coral, and schools of colourful fish in their playground, while the deep blue ocean made the perfect backdrop for this scene. Most of all, I felt a connection with them and their world. After the dive, I was asked if I wanted to continue learning to become a scuba diver, and I screamed "YES!" with all my heart.

I was then given a lot of theory work to complete my Junior Open Water. Even though it annoyed me that I had to study during my long awaited vacation in the Maldives, I realised that it was for the greater good. I studied day and night and was rewarded with small dives. On the 5th day I had completed all of my theory and practical work, and I was ready to go for my first open water dive. I was so happy the night before that I almost couldn't sleep, but I managed through the night and woke up the next day very enthusiastic. I went to the dive centre and since I learnt how to set up my kit, I proudly did the same.

We took a 20 minute boat ride to reach our dive site named, 'Maha Thila'. Once the boat halted, I plunged into the ocean with my gear on my back, and my instructor beside me. Over the next hour, I saw many exotic marine creatures such as a nurse shark, an eel, a pufferfish, tons of sea urchins, and a starfish who looked like Patrick from SpongeBob, but the icing on the cake was the rare sighting of 2 lionfish sleeping upside down in an underwater crevice, and a peacock mantis shrimp (AKA a boxing shrimp) peeking its head through a hole.

Since then, I am now a proud certified Advanced Open Water diver, and I look forward to exploring more of this blue world around the globe, learning from each experience to have a deeper understanding of this exotic life. I also wish to inspire my friends and family to do something adventurous and take a plunge to earn the experience of a lifetime!

ABOUT OM:
Om did his DSD and JOW with TGI in Oblu Helegenli in the North Male Atoll, Maldives, and is now an Advanced Open Water diver. Om goes to school at the Gems Modern Academy in Dubai.

THE SEA IN THE EYES OF CHILDREN

FEATURE **ROSARITA GAGLIARDI**

REASONS FOR THIS PROJECT

"The Sea in the Eyes of Children" is an international project proposed in collaboration with institutions, governments, and educational establishments. It is aimed at the entire population, particularly youths. The project responds to the call of the WHO for every state and organisation to adopt a policy of prevention and education regarding environmental respect and the aquatic world. Additionally, the project aligns with the objectives and values of COP28 to disseminate proper education and knowledge, enabling individuals to adopt appropriate behaviours for environmental sustainability.

By participating in this project, every individual, association, and institution can actively support, implement, and strengthen the expressed will of COP28 and the request made by the WHO, emphasising data that we must reflect upon:

- Human activities have profoundly altered the fundamental life cycles crucial for the global ecosystem's functioning.
- Human activities are contributing to the acceleration of significant climate changes that have already produced significant negative effects on biodiversity. (ISPRA environment data)
- The second leading cause of death globally is youths drowning between the ages of 4 to 19 years. Among those under thirty, half of the drowned individuals knew how to swim (pre-Covid19 WHO data). Clearly, in addition to swimming education, the causes must be sought in the lack of knowledge, the context, and the way individuals face and manage unexpected events and stress.

"The Sea in the Eyes of Children" is a theoretical and practical educational and training project targeting the youth aged 8 to 19. It is proposed within educational institutions and in collaboration with institutions. In the territory where the project is activated, the "Rights of the Sea" flag is handed over to the institutions. This flag signifies that concrete training policies for young people related to environmental knowledge and protection have been implemented in that territory:

- Knowledge, Safeguarding, and Environmental Protection
- Self-awareness through Stress Management in Emergencies
- Engagement with institutions through sensitising youths to interact synergistically with governmental bodies.

The project heeds the WHO's call for every state and organisation to adopt a policy of prevention and education regarding environmental respect and the aquatic world. Additionally, the project aligns with the objectives and values of COP28 to disseminate proper education, training, and knowledge for environmental sustainability.

The project places great importance on the environment and its respect. This stems from fostering respect towards oneself (understanding needs and resources) and others (comprehension, respect, boundaries, empathy, cause, and effect). Therefore, citizens with specific training and knowledge in this regard can adopt responsible manoeuvres and behaviours for the conservation and protection of both marine and terrestrial environments, and promoting sustainable practices. Moreover, the delivery of the "Rights of the Sea" flag signifies that in that city, nation, or territory, specific training in schools has been activated by institutions for self-protection, safety, self-awareness, and environmental respect. The display of the flag in beaches, oases, etc, is of particular interest to tourists, indicating that in that territory, people have received specific education on environmental respect and safety. It's an example that can be exported beyond the country, becoming a virtuous model to follow.

The project has significant implications for the territory in which it is implemented and spans across various sectors. It lays the groundwork for a genuine culture of sustainability, even in the world of business. The concept and education on sustainability have already and will continue to increasingly alter the approach to business and enterprise. It serves as a strategic lever capable of harmoniously and responsibly reconciling economic, environmental, and social needs. It's within the "State of Mind" of

integration and convergence of these three dimensions that sustainability can be achieved through a paradigm shift. Being sustainable means having a vision based on reciprocity, collaboration, respect, and the protection of various stakeholders and the environment in which we live.

HOW IT'S ACHIEVED:
The Sea in the Eyes of Children project is an educational initiative that entails a theoretical-practical training structured in consideration of the evolution and development of the students. The project aims to intersect and support the expected scholastic subjects, particularly engaging Sciences, Biology, Languages, Geography, History, Mathematics, Anatomy, and Physiology/Biochemistry.

The Sea in the Eyes of Children is built upon three fundamental pillars:
1. Synergy and collaboration with institutions.
2. Self-awareness through emotional intelligence work and stress management.
3. Respect and knowledge of the environment and territory.

As part of the educational programme, the involvement of significant institutional partners and professionals in aquatic rescue, relationship professionals such as counsellors, human resource facilitators, biologists, and experts from various fields such as apnea and rescue instructors is expected. Collaboration with marine reserves will also involve Marine Biologists and sector experts.

The programme will entail a theoretical/practical education on crucial knowledge and concepts for safety and self-protection. It also aims to cultivate concentration, self-awareness, emotional intelligence, and the management of emotional states, stress, and anxiety.

The journey will be initiated through dry practical activities (in the classroom) and water activities with apnea underwater paths. This specific practical training in water and on land begins with correct breathing education and "Breath Training" exercises.

Subsequently, this path will sensitise the students to respect both terrestrial and aquatic environments. This development leads to the sharing and creation by the youth of the "Rights of the Sea" flag, recognising the significance of the Sea as a legal entity. This step, originating from the creative work proposed for youths, in collaboration with the administration and institutions, will be extended and disseminated to other states. The goal is to introduce children to their history, such as that of pearl fishers and sponge fishermen, and how civilizations and economies evolved while respecting and valuing their origins.

Cities, territories, schools, regions, and countries that activate the project in their territory will, upon commission approval, receive the "Rights of the Sea" flag. The students participating in the training will become "Ambassadors of the Rights of the Sea". The sites where the "Rights of the Sea" flag will be exhibited following the realisation of the specific training of the "The Sea in the Eyes of Children" project will be indicated in the main sites of interest in nature, tourism, and sports.

"The Sea keeps the world together"
(as inscribed by a child on a wooden tablet found at sea).

The Sea is a metaphor for life and human experience on Earth. By the Sea, refers to the Sea of Life, the experiences in times of constant change. The Sea represents the water, which is the Blue Gold and the lifeblood of the Earth. Therefore, "The Sea in the Eyes of Children" signifies that the future reflects in the eyes of our children. It poses the responsibility of understanding how they see their future, and at the same time, the future will reside in their vision – a society that, like the Sea, unites the World!

RIGHTS OF THE SEA

https://apnea.bookus.it/

Reef Check
UNITED ARAB EMIRATES

Join the Reef Check
ECODIVER CERTIFICATION COURSE

LEARN TO CONDUCT REEF CHECK SURVEYS TO COLLECT DATA ON REEF HEALTH, AND HELP ASSESS CLIMATE CHANGE IMPACTS

When you join a Reef Check EcoDiver Training Course, you will learn about our local ecosystems and you will be able to participate in our regular survey dives which will help us to understand the threats our corals are facing by providing important data.

EDA
جمعية الإمارات للغوص
Emirates Diving Association

EMAIL: reefcheck@emiratesdiving.com **WEBSITE:** www.emiratesdiving.com/events/reef-check

EDA IS A NON-PROFIT NGO ACCREDITED BY UNEP AS AN INTERNATIONAL ENVIRONMENTAL ORGANISATION

DIVE INTO SCIENCE

WRAPS UP 2023 TRAINING ON CATALINA

BY **MORGAN MURPHY-CANNELLA, DIVE INTO SCIENCE PROGRAMME MANAGER**

This month, two cohorts of foster youths from Antelope Valley and Los Angeles participated in the Dive into Science Open Water Scuba certification course at Emerald Bay on Santa Catalina Island.

The Dive into Science (DIS) programme supports youths and young adults from underrepresented or Tribal communities to experience the ocean in a way that will support their long term educational or career goals. The programme offers scuba and scientific diving certification courses, experiential ocean stewardship training, and marine science educational opportunities.

During the two weeks on Catalina Island, the students learned about scuba theory, practiced and mastered scuba skills, learned about kelp forest environments, and dove in a Marine Protected Area (MPA). In addition to scuba diving, the students also had lessons on kelp forest indicator species, career opportunities in marine science/scuba diving, and team building exercises. They also got to participate in a PADI Open Water course taught by In2Deep dive shop, which consisted of 5 days of scuba practice.

Reef Check is grateful to have received funding for the programme through the California State Park Outdoor Equity Grants Program (OEP), which aims to improve the health and wellness of Californians through new educational and recreational activities, service learning, career pathways, and leadership opportunities that strengthen a connection to the natural world.

The dive class was primarily focused in Doctor's Cove which is situated in the Arrow Point to Lion Head Point State Marine Conservation Area (SMCA). This is a no-take of invertebrates MPA and students were able to witness how an MPA can protect habitat and species diversity. The completion of this Open Water certification provided students a glimpse into the underwater world, as well as a stepping stone to continue their progression towards scientific diving.

Training new ocean stewards is essential for safeguarding the health of our oceans and ensuring a sustainable future for both the environment and human society.

The completion of this training concludes the DIS programme courses for the 2023 calendar year but we are looking forward to starting more cohorts with Northern California Tribal communities and Southern California foster youth communities in 2024!

Being in Catalina and having the opportunity to dive is something I'll forever be grateful for. I was able to dance with the kelp, kiss fish, live the beautiful island life, face my apprehension to the ocean and most importantly recreate with folks who come from the same community that I do. We normally aren't here doing this sport. After this experience I am a more confident diver and am incredibly excited to keep colouring the ocean!

Carol Martinez – Los Angeles cohort

As someone who thought they would stay in the desert environment all their life, going to Catalina was a completely new and amazing experience I thought I would never get to go on. I became mentally and physically stronger from the experience of gearing up and being under the water. I had a fear of dark water before this experience because I didn't know what was hiding there, and now I know that life under the water is actually very calm and serene so my fears are gone. Scuba diving is not something I have ever heard another person from my community partaking in, so it was amazing that I and the new friends I made throughout the experience were able to get trained in this particular skill. I hope to continue on to the next phases with my cohort because it will only get more exciting from here!

Christy Jilavdaryan – Antelope Valley cohort

REEF CHECK MALAYSIA
CELEBRATES 16 YEARS WITH AN EVENTFUL SUMMER

BY **REEF CHECK MALAYSIA**

Reef Check Malaysia (RCM) has had a very eventful past couple of months. In July and August, they successfully campaigned against the construction of a new airport on Tioman Island that would have destroyed the biodiversity of the island, caused air, noise and water pollution, and disrupted the community's livelihood. After a long campaign, and with the support of various people and organisations and solidarity from the Reef Check Foundation itself, the Minister of Natural Resources and Climate Change of Malaysia decided against the new airport. It is indeed a big win for the environment and the community.

Our team in Semporna, Sabah, is training youths in Larapan, Mabul and Kulapuan to conduct coral rehabilitation activities in Kulapuan Island under the IKI Coral Restoration project, a project by RCM to empower the local community in marine conservation activities. These youths will be certified as divers, trained as EcoDivers and will receive training on how to do coral rehabilitation work. Youths are the future, and getting them involved when they are young is our best preparation for the future.

Our team at Mersing Islands, Johor, has organised and conducted EcoDiver training for the local community. This training activity is one of our ongoing efforts to encourage islanders and local communities to participate in the conservation efforts at the Mersing Islands.

In September, we coordinated a nationwide International Coastal Cleanup (ICC). Over 10,000 volunteers managed to remove over 26,000kg of trash from the coastlines of Malaysia. This initiative is important not only to keep this trash away from the ocean, but also to strengthen awareness of the harm of marine pollution. We are thankful for everyone's support and the sponsors of this year's ICC, TechnipFMC and Zoom, for their generous donations that helped make this year's ICC a success.

The coral rehabilitation work is still ongoing at all of our bases and coral monitoring in Tioman Island has shown that the coral fragments are growing well.

Finally, Reef Check Malaysia turned 16 on August 3! The past 16 years have been an adventure as we manoeuvre the ups and downs of protecting and saving coral reefs in Malaysia. We are thankful for the support of our funders, supporters and volunteers who have helped us and kept us going. We have expanded to having bases on Tioman Island, Mersing Islands, Mantanani Island, Semporna Island and Kota Kinabalu in Sabah and Redang Island. We are also now 22 staff strong.

Visit **www.reefcheck.org.my** to find out how you can get involved.

SIGNS OF HOPE IN THE MALDIVES

BY **BIOSPHERE EXPEDITIONS**

Since the first trip to the Maldives in 2011, Biosphere Expeditions has thus far trained over 100 people in Reef Check surveying, including over 30 local Maldivians in techniques on how to monitor their reefs and set up community-based monitoring schemes. As a direct result, local NGO, Reef Check Maldives was formed in 2017 and is now active in community-based reef conservation work and advocacy.

Biosphere recently concluded its latest trip and brings us this update: We came here feeling pessimistic. Reefs are battered from all sides – warming oceans, bleaching, acidification, overfishing, exploitation, you name it, we humans inflict it on reefs and the natural world. Indeed some say that this current decade is the last to prevent the total collapse of reefs worldwide.

So we did not expect to find signs of hope, but we have. A dim light at the end of the tunnel, a flicker of hope, however faint. It's no reason to celebrate, but it shows why citizen science is so important. Without the citizen scientists

on this expedition, this message, which we will write up in a scientific report, would not exist or be heard. So thank you to all those on board for enabling this with their efforts and funds.

We have found some cause for hope for previously badly affected sites, mainly from the last 2016 mass bleaching event. Sites that are grazed by herbivorous fish and have not been colonised by corallimorphs, have partially recovered since 2016. True, the recovery is slow, but there is some recovery. Baby corals are taking a foothold, surviving on the skeletal corpses of once great boulder corals, finding a space for new life in between dead coral branches by clinging on and growing. But those reefs that have been colonised by corallimorphs are getting worse. They are or have phase shifted from coral to corallimorph reefs, blanketed by nothing but these fleshy creatures, which nothing eats and which take over everything. Once the brown carpet has taken over, nothing is left – no fish, no invertebrates, no corals. This has happened in other parts of the world, for example in Bermuda, where few coral reefs are left.

But we are not at this point in the Maldives, and we hope our work makes a small contribution to never getting there. Biosphere's next Maldives expedition is scheduled for 5-11 October 2024. For more information on how to participate, go to: **www.biosphere-expeditions.org/volunteeringinmaldives.com**

KHOR FAKKAN HOSTS VITAL REEF CHECK COURSE
A MARINE CONSERVATION MILESTONE!

BY **DR ALI AL AJMI, REEF CHECK OMAN**

In a crucial step towards safeguarding our oceans, the vibrant city of Khor Fakkan in the United Arab Emirates hosted a Reef Check EcoDiver course on the 16th of September 2023. This landmark event, meticulously coordinated by Coral Life group, saw the enthusiastic participation of seven ocean advocates.

Under the expert guidance of Reef Check EcoDiver Trainer Dr Ali Al-Ajmi of Reef Check Oman, participants delved into the theoretical foundations of marine ecosystems at the prestigious University of Khor Fakkan. Following this, they took the plunge into the depths of Khor Fakkan's sea for an immersive, hands-on experience, actively applying their newfound knowledge.

This initiative showcases a united front in the battle to conserve our marine treasures, exemplifying the power of collaboration and education.

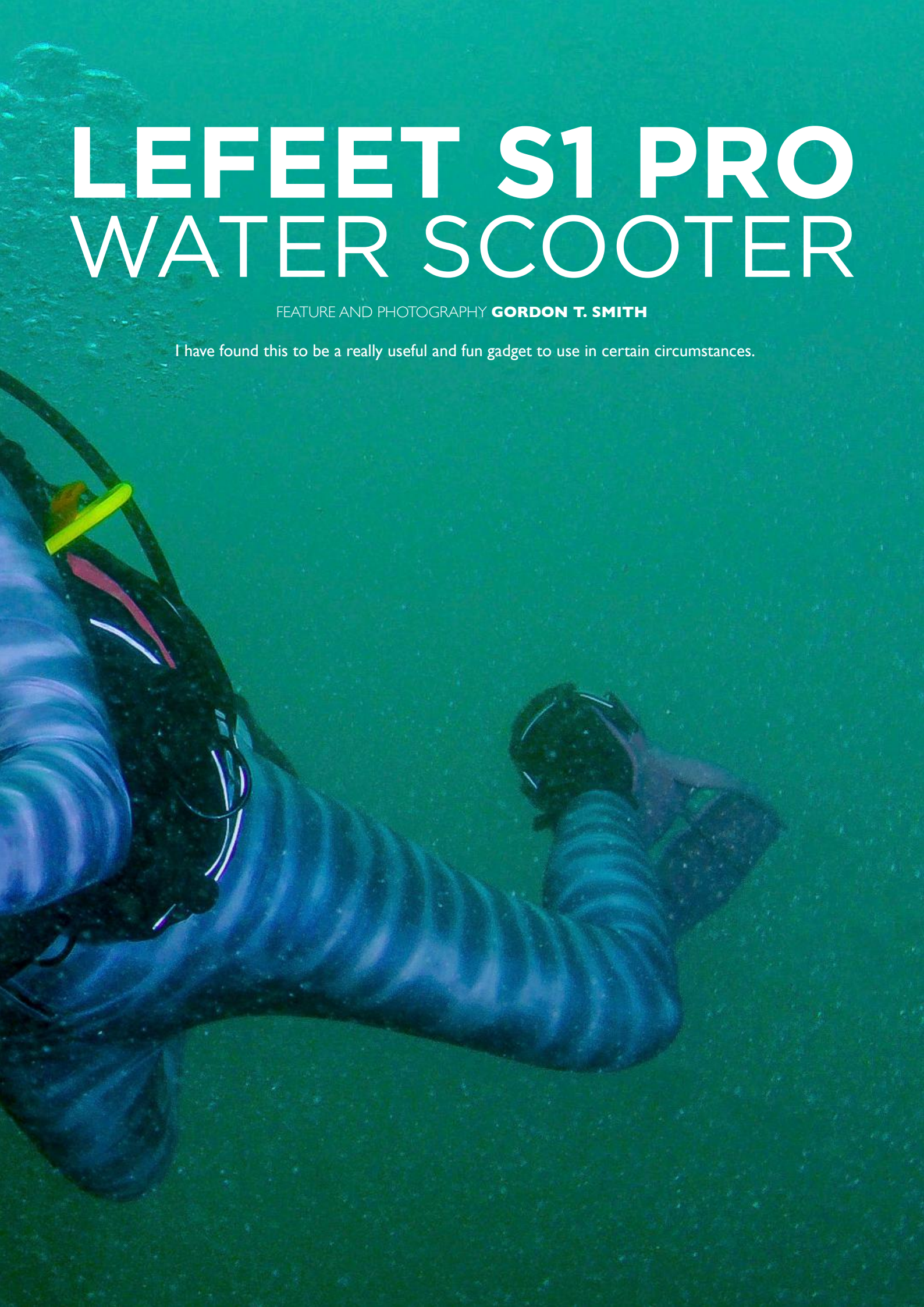
Training divers in a Reef Check course is crucial for reef conservation. It educates them on reef dynamics, enabling threat identification. Divers learn to assess reef health, aiding data-driven conservation efforts. This training instills responsibility, promoting sustainable diving practices and fostering environmental stewardship.


SCUBAPRO
GORDON SMITH
TRAVELIGHT

LEFEET S1 PRO WATER SCOOTER

FEATURE AND PHOTOGRAPHY **GORDON T. SMITH**

I have found this to be a really useful and fun gadget to use in certain circumstances.



Back in March 2023 during the Dubai Boat Show, I was shown a small underwater scooter manufactured in China by a company called Lefeet. Given its diminutive size compared to the larger scooters used by some of my technical diving buddies (Suex etc.), I had some doubts on its capability to be a contender in what seemed to me to be dominated by larger and more powerful existing scooters in the market.

However, coming in a fraction of the price of the existing competitors, it did make me wonder if there really is a market for such a product. I really needed to try this out for myself, but the manufacturer didn't really have a spare one to lend me.

Another exhibitor at the show, Dawit Gerbe, was promoting a liveaboard based out of Djibouti. In short, we got talking and he was in the process of setting himself up as the agent for Lefeet here in the region, and he had a demo model of the scooter that he kindly lent me. I subsequently took it for a dive off the beach in Dubai, testing it in some extreme current of spring tides.

Okay, this is not an underwater mask ripping sports vehicle, but it could pull me along against the current dragging a camera housing clipped off to one of my wing harness D-rings, which creates a bit more drag than a normal diver without a camera.

After some negotiation with Ricky Chung of Lefeet, I received my own personal scooter for testing a few weeks after the boat show. Feedback from several of my non-tech buddies, including some dive instructors has been very positive and all of them enjoyed the experience. One of my tech buddies actually went out and bought one from Bermuda Divers and has been using his scooter to explore the wrecks around Dubai and off the east coast of the UAE. Bear in mind, the depth limitation of this model is 40m.

At AED2,938 direct from the manufacturer (excluding shipping, VAT, and import tax) or AED3,150 from Bermuda Divers in Dubai, makes this small scooter great value for money compared to other scooters in the same class.

With a 40m depth rating, this is not designed for the technical market but more for recreational use, in particular when exploring a large wreck such as My Princess, Zainab etc, off the UAE west coast. Having the scooter helps deal with any unexpected current and decreases air consumption too.

Battery life depends on usage and what power setting is chosen. I have found that using the second/middle of the three settings can provide sufficient power for two reasonable dives on My Princess, a 100m long wreck, so it's not too shabby. I rarely used it 100% of the dive anyway.

Additionally, it can be doubled up using a second motor with a larger bracket to combine both units should you be looking at more power. The power unit itself is linked via a wireless connection to the control unit, which is inside the right-hand handle, and this requires separate charger to the main unit (USB cable connection supplied), and one control unit can operate both power units simultaneously.

The scooter comes with a wrist lanyard, but

I found that using a bolt snap onto a 5mm thick lanyard connected to my harness D-ring was more suitable and allowed hands free for other functions, not least taking photos.

And on the subject of photos, it comes with a GoPro mount at the front of the unit, although with minor modification I managed to fit my Isotta GoPro housing on the same location.

I think some further customisation would be possible with a few modifications to the bracket. Lights could be added or even a new nose cone with a light might be possible from the manufacturer. Fittings to attach a large video housing are probably available and from what I've seen online, some people have already done this.

It would also be nice if the manufacturer made the front cover in different colours, which would aid identification when several divers are using them together.

The scooter is small enough to take with you on an aircraft, provided the battery is removed and taken as hand baggage. The whole unit weighs 2.3kg with the battery installed, and the battery itself is 764g. If planning more than two dives daily, then a second battery would be highly recommended.

The power unit can also be attached to a scuba tank with a specific adaptor, and the control unit would then be hand held using a safety lanyard on the wrist. Trim and buoyancy need to be good in order to avoid any issues though.

Similarly, the Lefeet S1 Pro can be fitted to a paddle board on the underside with the appropriate adaptor.

In summary, I have found this to be a really useful and fun gadget to use in certain circumstances. I haven't travelled with it, and given the amount of photo gear I carry on trips, it's highly unlikely that I will add to my already overweight hand baggage. However with the weight spread over a family travelling, then it shouldn't be an issue.

Check out all the available options at:
www.lefeet.com

PRODUCT SPECIFICATIONS

Weight: 2.5kg (Including battery)
Dimensions: 30x10.2x10.2cm
30x30x16cm (with bracket)

Working Temperature: 0°C-40°C
Depth Rating: 40m

Three Speed Settings
Low: 1.2m/s | 4.3km/h
Medium: 1.5m/s | 5.4km/h
High: 1.8m/s | 6.5km/h
Dual Jet Maximum: 2.3m/s | 8.28km/h
Thrust: 8kgf
*Capable of carrying weights exceeding 100kg

Battery Life: 35-70 mins
Charging Time: 2.5h
Remote Controller Life: 2.5h
Remote Controller Charge Time: 1.5h
Battery Rated Capacity: 4400mAh
Rated Energy: 97.68 Wh
Charging Temperature: 10°C-45°C
Battery Weight: 0.76kg

CLEANUP ARABIA 2023

FEATURE AND PHOTOGRAPHY **ALLY LANDES**

Well done to everyone who took part in removing as much rubbish as was possible from the beach and underwater; to everyone who counted and weighed all the items, and an especially big hand of applause to the kids!

AN EVENT BY: EDA جمعية الإمارات للغوص Emirates Diving Association

STRATEGIC PARTNER: DP WORLD

حملة النظافة العربية

CLEANUP ARABIA

SINCE 1995

CUA GOLD PARTNER:

DOXA 1889

CLEAN-UP PARTNERS:

هيئة الفجيرة للبيئة
FUJAIRAH ENVIRONMENT AUTHORITY

Ocean Conservancy

Goumbook CHANGING MINDSETS

The DP World team.

The Ahmed Seddiqi & Sons/DOXA team.

What an incredible Cleanup Arabia event we had on the 11th of November 2023, in Dibba Fujairah! We couldn't be prouder of our ocean loving community of partners and members. We had a total of 171 participants turn up out of the registered 214, and we collected a total of 1,359.64kg in this year's campaign!

Well done to our 80 (61 adults, 19 kids) beach participants for holding out as long as you did. It was so hot this year that we had to wrap up an hour earlier than planned, but as a group we still pulled a tremendous effort at the beach and collected 134.24kg of rubbish. It was shocking to everyone to see just how much rubbish there was on a beach full of campers. The biggest question asked, was: why would anyone want to camp around so much rubbish?

We always ask everyone to wear closed shoes when we do clean-ups for good reason. The most hazardous items on the beach collected were the masses of shards of broken glass, 3 syringes (with needles exposed), a blade, and all the sharp wooden BBQ skewers lying in the sand. Despite an empty skip at the location, campers left rubbish bags (when they were used) by the car lane for someone else to dispose of them.

We separately collected a total of 21,150 cigarette butts (which are 95% plastic & toxic to the environment) for Goumbook's Waste to Value campaign where they are recycled into a new circular material. Cigarette butts still today make up 30%-40% of the items picked up in annual coastal and urban clean-ups. We have sadly been adding disposable E-cigarettes to that criteria since their existence.

A big shout out to the East Coast dive centres for organising the dives:

1. Goblin Diving Center collected 252kg from Al Bidya Port.
2. Sandy Beach Diving Academy collected 49.4kg from Al Bidya Port.
3. Divers Down collected 234kg from Dadhna Harbour.
4. Al Boom Diving collected 30kg from Dadhna Harbour.
5. Nemo Diving Center collected 60kg from Dibba Port.
6. Freestyle Divers collected 100kg from Dibba Port.

And last, but not least:

7. The Deep Dive Dubai team did their CUA dive, with Al Jazeera Diving & Swimming Center in Ras Al Khaimah and collected 500kg of ghost nets from the Ajman Glory wreck on the 13th of November.

We want to give an even bigger shout out to EDA's Strategic Partner, DP World and their team who took part in both the beach and dive clean-ups, and to our CUA 2023 Gold Partner, Ahmed Seddiqi & Sons/DOXA 1889 and their team who also took part in both the beach and dive clean-ups, but most of all, for supporting us all to make this year's event such a success!

Well done to everyone who took part in removing as much rubbish as was possible from the beach and underwater; to everyone who counted and weighed all the items, and an especially big round of applause to the kids!

Hard work pays off, but you all made it so much fun and so rewarding.

Thank you to the Radisson Blu Resort Fujairah for hosting a lovely venue and lunch for all of us to get together at the end of all our clean-ups.

All the event photos can be viewed on the EDA website: **www.emiratesdiving.com/events/cleanup-arabia**
Or on our Facebook page:
https://bit.ly/3QQnGGv

DOXA

1889

The symbol of your call to adventure? A DOXA watch. The timekeeper for your journey to every new frontier and beyond. DOXA was born in Le Locle in the heart of Swiss watchmaking and now based in Biel/Bienne.

Since 1889, our savoir-faire is tightly interwoven with tradition and ongoing expertise. Among the many milestones, DOXA was in 1967 the first brand to introduce the first divers' watch available to the general public, featuring a unidirectional rotating bezel to monitor dive time and ensure a safe no-decompression ascent back to the surface. With radical innovations, the DOXA SUB became an easily recognisable legend with the hallmark orange dial.

Today, DOXA Watches remains faithful to the principle established over a hundred and thirty years ago: to produce high quality watches at affordable prices. The "DOXA SUB" designation stands for some of the most iconic divers' watches in watchmaking history. And the legend lives on.

#YourCallToAdventure

The SUB 300ß Sharkhunter is available at Ahmed Seddiqi & Sons store – Dubai Mall, Mall of the Emirates & Mirdif City.

BEACH CLEAN-UP | FUJAIRAH	
Al Aqah Beach | 61 Adults + 19 Kids	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Grocery Bags (plastic)	114
Other Bags (plastic)	27
Beverage Bottles (glass)	175
Beverage Bottles (plastic)	424
Beverage Cans	345
Beverage sachets/pouches	23
Bottle Caps (metal)	663
Bottle Caps (plastic)	2,492
Cigarette Butts	21,150
Cups, Plates (foam)	23
Cups, Plates (paper)	216
Cups, Plates (plastic)	170
Food Containers (foam)	10
Food Containers (plastic)	26
Food Wrappers (candy, chips, etc)	101
Lids (plastic)	47
Straws/Stirrers (plastic)	123
Utensils (plastic)	173
FISHING & BOATING	
Line, nets, traps, rope, etc	3
Foam Dock Pieces	1
ILLEGAL DUMPING	
Construction Materials	3
PERSONAL HYGIENE	
Diapers	9
Syringes	3
OTHER ITEMS/DEBRIS	
Clothing	6
E-cigarettes	2
Footwear (shoes/slippers)	1
Tobacco Products (lighters, wrap)	15
Toys	7
Other Waste (metal, paper, etc)	115
OTHER ITEMS NOT LISTED	
Knife	1
GRAND TOTAL OF ITEMS	**26,468**
TOTAL BAGS COLLECTED	**20**
TOTAL WEIGHT (KG)	**134.24**















SAVE THE SEA












INSPIRING CHANGE TO MAKE A DIFFERENCE TOGETHER



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GOBLIN
Diving Center

GOBLIN DIVING CENTER | FUJAIRAH	
Al Bidya Port Clean-up | 17 Adults	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Grocery Bags (plastic)	5
Other Bags (plastic)	25
Beverage Bottles (glass)	5
Beverage Bottles (plastic)	5
Beverage Cans	19
Beverage sachets/pouches	1
Cups, Plates (foam)	2
Cups, Plates (paper)	3
Cups, Plates (plastic)	1
Food Containers (foam)	2
Lids (plastic)	1
Utensils (plastic)	3
FISHING & BOATING	
Line, nets, traps, rope, etc	20
PACKAGING MATERIAL	
Strapping Bands	4
ILLEGAL DUMPING	
Appliances	1
Tyres	13
PERSONAL HYGIENE	
Gloves & Masks (PPE)	2
OTHER ITEMS/DEBRIS	
Clothing	6
E-cigarettes	6
Paper Bags	5
Tobacco Products (lighters, wrap)	2
Other Plastic Waste	10
Other Waste (metal, paper, etc)	2
OTHER ITEMS NOT LISTED	
Boat Marina Metals	5
Carpet	1
Metal Bars	8
Pipes	3
Anti Slip Mats	2
Tarp	7
Kitchen Knives	5
Plastic Hose	2
Ceramic Bowl	1
GRAND TOTAL OF ITEMS	**143**
TOTAL BAGS COLLECTED	**20**
TOTAL WEIGHT (KG)	**252**

SANDY BEACH DIVE ACADEMY

SANDY BEACH DIVE ACADEMY | FUJAIRAH	
Al Bidya Port | 11 Adults	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Grocery Bags (plastic)	22
Other Bags (plastic)	22
Beverage Bottles (glass)	12
Beverage Bottles (plastic)	23
Beverage Cans	16
Beverage sachets/pouches	1
Utensils (plastic)	1
FISHING & BOATING	
Line, nets, traps, rope, etc	60
ILLEGAL DUMPING	
Construction Materials	13
OTHER ITEMS/DEBRIS	
Clothing	28
E-cigarettes	1
Footwear (shoes/slippers)	7
Other Plastic Waste	15
Other Waste (metal, paper, etc)	9
OTHER ITEMS NOT LISTED	
Rubber Pieces	15
GRAND TOTAL OF ITEMS	**261**
TOTAL BAGS COLLECTED	**3**
TOTAL WEIGHT (KG)	**49.4**

DIVERS DOWN | FUJAIRAH

Dadhna Harbour | 29 Adults

MOST LIKELY TO FIND ITEMS	TOTAL
Other Bags (plastic)	62
Beverage Bottles (glass)	53
Beverage Bottles (plastic)	542
Beverage Cans	53
Beverage sachets/pouches	3
Cups, Plates (paper)	7
Cups, Plates (plastic)	41
Food Containers (foam)	1
Food Containers (plastic)	24
Food Wrappers (candy, chips, etc)	26
FISHING & BOATING	
Line, nets, traps, rope, etc	54
ILLEGAL DUMPING	
Tyres	3
PERSONAL HYGIENE	
Diapers	
Syringes	
OTHER ITEMS/DEBRIS	
Clothing	9
E-cigarettes	2
Electronic Waste (phones, batteries)	10
Other Waste (metal, paper, etc)	109
OTHER ITEMS NOT LISTED	
Scissors	2
Knives	2
Pipes	14
Fire Extinguisher	1
Anchor	1
GRAND TOTAL OF ITEMS	**1,019**
TOTAL BAGS COLLECTED	**13**
TOTAL WEIGHT (KG)	**234**

Al Boom Diving

AL BOOM DIVING | FUJAIRAH	
Dadhna Harbour | 9 Adults + 1 Youth	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Grocery Bags (plastic)	10
Other Bags (plastic)	30
Beverage Bottles (glass)	22
Beverage Bottles (plastic)	25
Beverage Cans	16
Beverage sachets/pouches	16
Bottle Caps (metal)	7
Bottle Caps (plastic)	29
Cups, Plates (foam)	1
Cups, Plates (paper)	20
Cups, Plates (plastic)	15
Food Containers (plastic)	16
Lids (plastic)	10
Utensils (plastic)	19
FISHING & BOATING	
Line, nets, traps, rope, etc	16
Foam Dock Pieces	14
ILLEGAL DUMPING	
Construction Materials	15
PACKAGING MATERIAL	
Other Plastic Bottles (oil, bleach, etc)	20
Strapping Bands	15
OTHER ITEMS/DEBRIS	
Clothing	5
E-cigarettes	
Footwear (shoes/slippers)	5
Tobacco Products (lighters, wrap)	
Toys	
Other Plastic Waste	10
TINY TRASH LESS THAN 2.5CM	
Plastic/Foam Pieces	15
OTHER ITEMS NOT LISTED	
Aluminium Tubes	7
Aluminium Cover	2
GRAND TOTAL OF ITEMS	**351**
TOTAL BAGS COLLECTED	**3**
TOTAL WEIGHT (KG)	**30**

FREESTYLE DIVERS

FREESTYLE DIVERS | FUJAIRAH	
Dibba Port | 6 Adults	
MOST LIKELY TO FIND ITEMS	**TOTAL**
Grocery Bags (plastic)	34
Other Bags (plastic)	47
Beverage Bottles (glass)	40
Beverage Bottles (plastic)	72
Beverage Cans	2
Bottle Caps (metal)	9
Bottle Caps (plastic)	40
Cigarette Butts	51
Cups, Plates (foam)	7
Cups, Plates (paper)	21
Cups, Plates (plastic)	4
Food Containers (plastic)	4
Food Wrappers (candy, chips, etc)	260
Straws/Stirrers (plastic)	2
Utensils (plastic)	6
FISHING & BOATING	
Foam Dock Pieces	25
PACKAGING MATERIAL	
Foam Packaging	11
Other Plastic Bottles (oil, bleach, etc)	1
ILLEGAL DUMPING	
Tyres	1
PERSONAL HYGIENE	
Condoms	2
OTHER ITEMS/DEBRIS	
Clothing	2
Electronic Waste (phones, batteries)	1
Footwear (shoes/slippers)	2
Tobacco Products (lighters, wrap)	3
GRAND TOTAL OF ITEMS	**674**
TOTAL BAGS COLLECTED	**6**
TOTAL WEIGHT (KG)	**100**

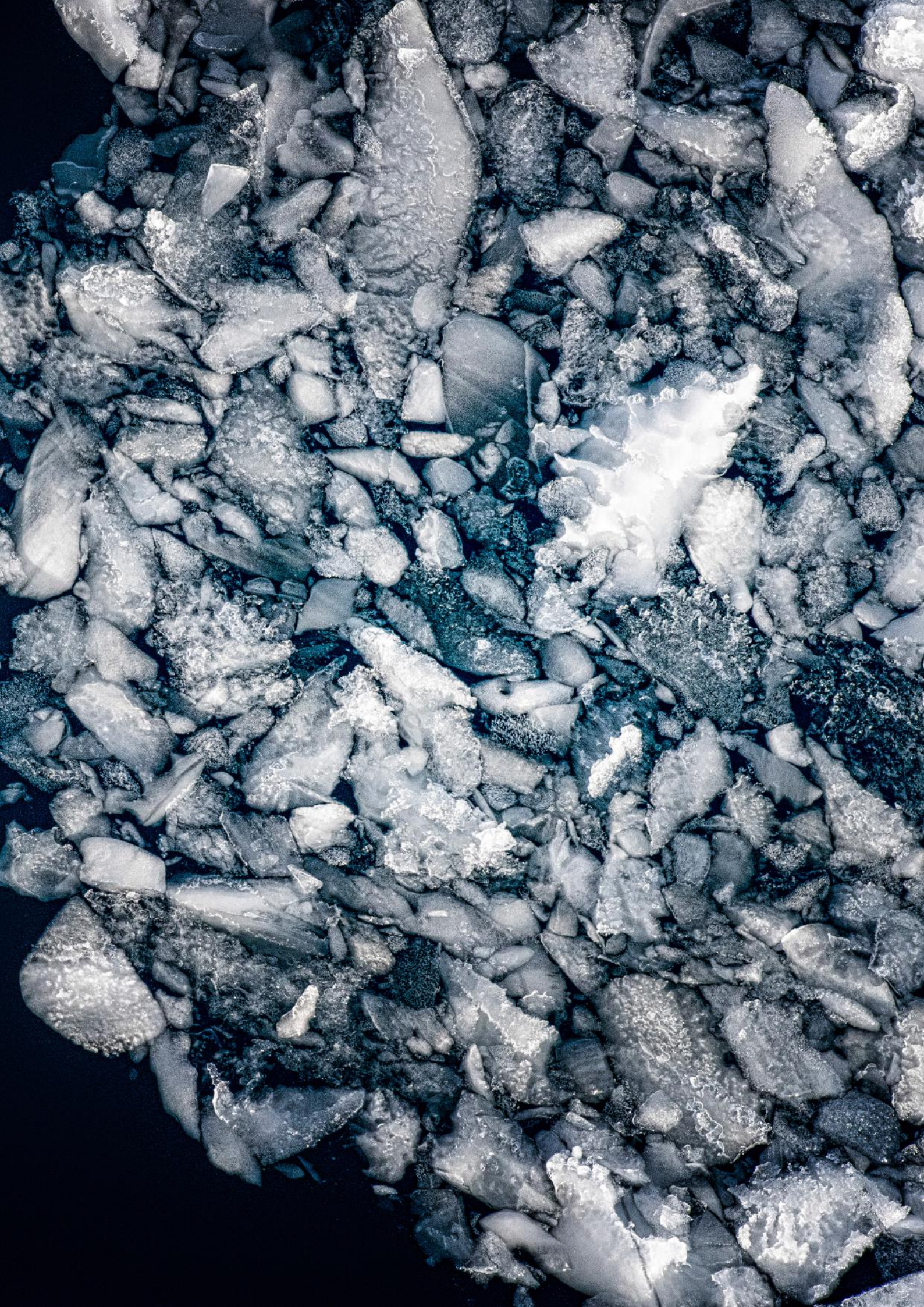
NEMO DIVING CENTER | FUJAIRAH	
Dibba Port | 10 Adults	
RECORD	
Count of items was not done	–
GRAND TOTAL OF ITEMS	**–**
TOTAL WEIGHT (KG)	**60**

DEEP DIVE DUBAI | AJMAN	
Ajman Glory Wreck | 8 Adults	
FISHING & BOATING	
Line, nets, traps, rope, etc	1
GRAND TOTAL OF ITEMS	**1**
TOTAL WEIGHT (KG)	**500**

CLIMATE CHANGE AND MELTING ICE

FEATURE AND PHOTOGRAPHY **LORENZO MITTIGA**

In Antarctica, the impacts of climate change are more visible than in many other parts of the world. Studying this region and the Southern Ocean provides crucial insights into how human activities influence global warming and what steps we might take to mitigate these effects.



ABOVE: Scientific shelter at King George island. **OPPOSITE PAGE:** Edge of a glacier with "green snow". Green Snow effect caused by the seasonal blooming of microscopic greens on the ice surface. This phenomenon is relatively recent and is increasing due to the climate change effects

Reflecting on the words of the great explorer Roald Amundsen, who first reached the South Pole in 1911, I'm reminded of how he described Antarctica: colder than Siberia, drier than the Gobi Desert, windier than Mount Washington, and more desolate than the most barren parts of Arabia. Today, as I visit this "alien" land, I see its symbolic importance – a largely untouched, fragile ecosystem where the effects of global warming are starkly evident.

In Antarctica, the impacts of climate change are more visible than in many other parts of the world. Studying this region and the Southern Ocean provides crucial insights into how human activities influence global warming and what steps we might take to mitigate these effects.

As a photographer dedicated to conservation, I've been privileged to witness the unique and stark beauty of the Antarctic, the most isolated and intriguing region on our planet. This area stands as a vital indicator of the widespread impacts of climate change. The next decade is pivotal in our journey to safeguard the Earth for future generations.

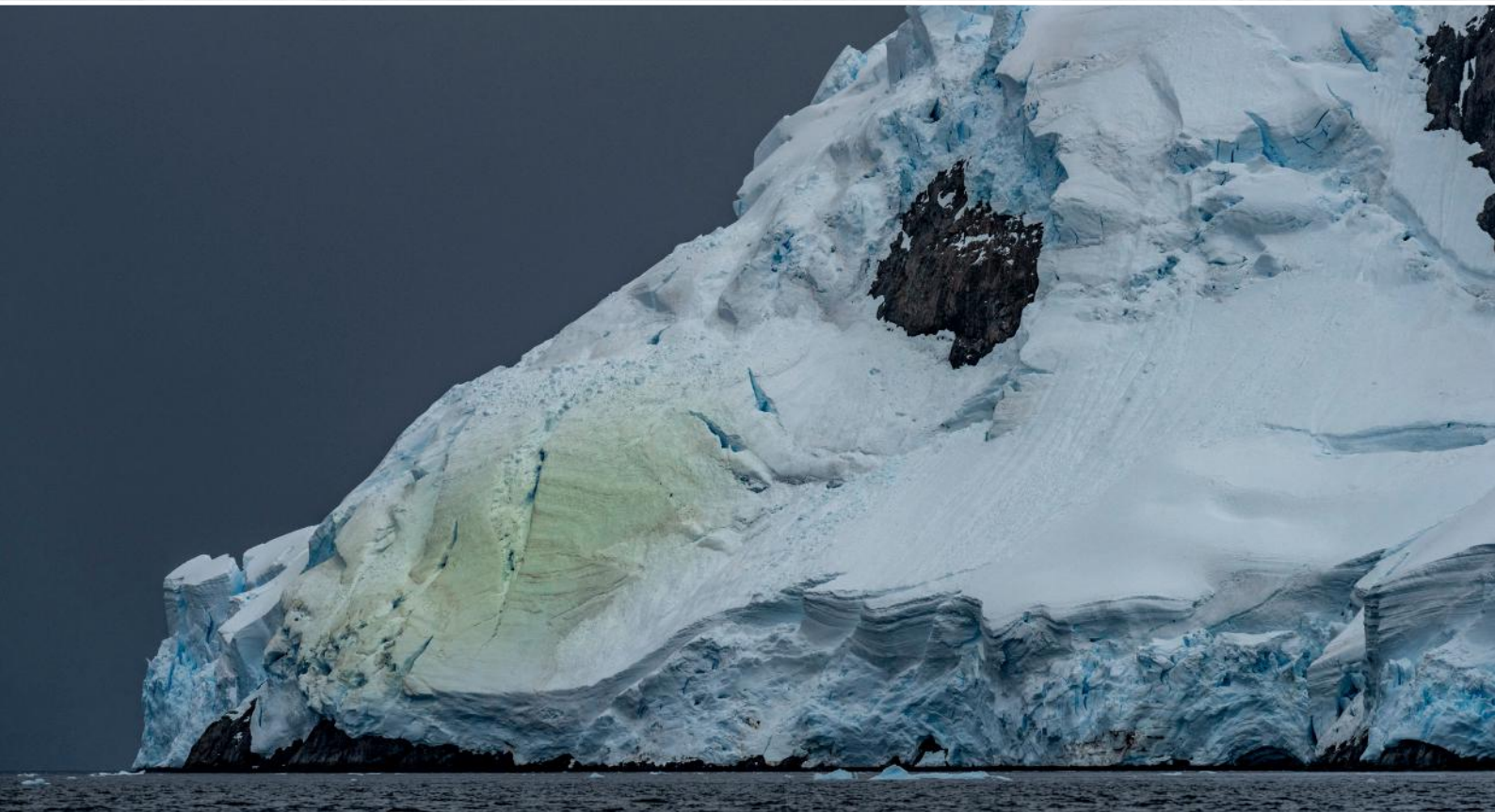
During my recent journey with the ACE 2023 expedition, the transformations I observed were more profound than I had expected. Through my lens, the changes in Antarctica's landscapes and its wildlife were not just visible but deeply impactful. While change is a natural part of such extreme environments, the scale and speed of these changes are alarming. Intriguingly, some of these shifts are tied to global phenomena, making their mitigation a complex challenge.

As visitors, we must remember we're the outsiders here. Our guides constantly remind us to respect the wildlife – keeping a distance from penguins and seals, and being mindful of nesting petrels. We must follow strict rules to protect this environment: cleaning our gear to prevent introducing foreign organisms, disinfecting our muck boots, and securing our belongings against the unpredictable winds.

One of the most concerning effects of climate change here is its impact on the Adélie penguin population. Their numbers have dramatically decreased due to melting ice and diminishing krill populations, their primary food source. In just a few decades, their numbers have plummeted from 100,000 to 30,000.

On this expedition, the signs of climate change were unmistakable – from unusual snowfall patterns and penguin chicks struggling to survive, to retreating glaciers and the spread of green snow algae. Despite these changes, Antarctica's beauty remains breathtaking, with its unique landscapes and wildlife.

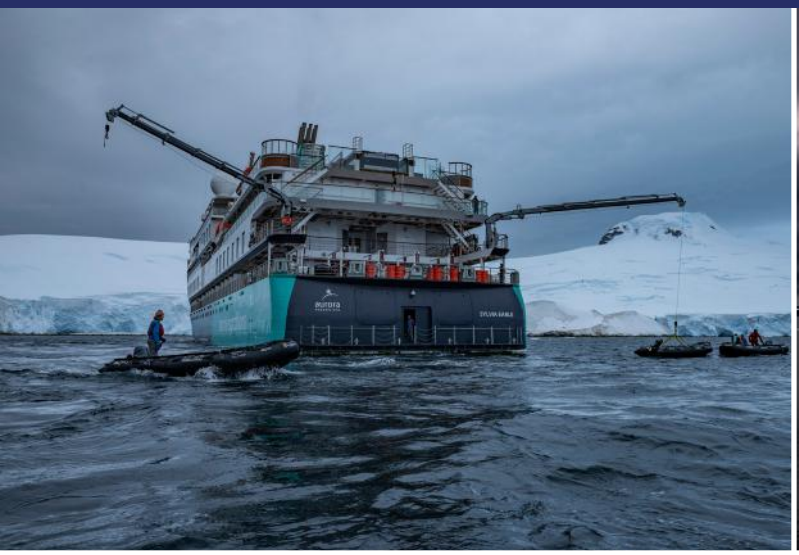
The changing climate is not only affecting the Adélie penguins but also the Gentoo penguins, distinguished by their bright red beaks. While



Lichens under the ice. During the Antarctic summer, lichens are visible under the melting ice. These are the only vegetation growing at this latitude.

When Adélie penguins feel theatened in the water by their main predator, Leopard seals, they find shelter on icebergs where it's difficult for the heavy predators to climb up.

A Leopard seal resting on the ice-pack after a day of hunting.







ABOVE: Antarctic Expedition ship; Graham Passage; Split shot of a small iceberg; National Geographic photographer, Jennifer Hayes in a recognition dive on kelp beds at Snow island; Antarctic Fur Seals at Heroine's Island; Gentoo penguin on shore at King George Island; and Lorenzo Mittiga, photo by Jennifer Hayes.

some populations are thriving in Antarctica, they face challenges on sub-Arctic islands.

A critical situation is driving Antarctica into uncharted territory, resulting in severe impacts. The emergence of darker and more extensive blooms is hastening the rate at which ice and glaciers melt in the Antarctic Peninsula. It's becoming increasingly clear that snow algae, growing in abundance, will be a major factor in accelerating the melting of snow by diminishing the "albedo" factor (measure of how much sunlight a surface reflects into space, with higher albedo indicating greater reflectivity and less absorption of heat) in these regions over the next few years. We were witnesses to the biggest expanse of snow fields covered with green, red algae at all 10 locations visited. Microplastics were found in all samples, and an unprecedented number of orphaned or born too late to survive penguins were seen in all landings. We were also overwhelmed by unusual rains and wet snowfall.

The climate crisis is also affecting the marine food chain, notably the availability of krill. This decrease in food supply impacts the reproductive success of Antarctic fur seals and alters the predatory behaviour of leopard seals.

The melting Antarctic ice, receding at a rate of 10 metres per year, poses a significant threat to the region's seabirds and marine mammals, like seals. This habitat loss is a profound reminder of the urgent need to address climate change.

The way Antarctic ecosystems are responding to warmer, more acidic oceans is a subject of intense study and concern. Addressing these changes requires a multifaceted approach, blending scientific research with decisive actions from global policymakers and contributions from people worldwide.

The warming trend in the Antarctic Peninsula is particularly striking. As per the IPCC reports, the region's temperature is rising at a rate five times faster than the global average. Since 1950, there's been an increase of nearly 3°C, an unparalleled change in our planet's history. This warming has significant implications for local wildlife, ice structures, and oceanic conditions. Notably, the ocean to the west of the peninsula has warmed by over 1°C since 1955. Additionally, the Antarctic Circumpolar Current is experiencing a warming trend faster than the rest of the world's oceans, a fact that underscores the urgency of the situation.

GREEN FINGERED MENACE

FEATURE **JAMES CAMPBELL** PHOTOGRAPHY **FREESTYLE DIVERS & HILTON SCOTT**

"Coral gardening is a fantastic, pro-active strategy to drive community involvement in coral conservation; however, improper methodologies, as good intentioned as they may be, can have detrimental effects on the very reefs they are trying to conserve".

"Coral gardening is a fantastic, pro-active strategy to drive community involvement in coral conservation; however, improper methodologies, as good intentioned as they may be, can have detrimental effects on the very reefs they are trying to conserve".

I previously wrote an article called "Green fingered divers" explaining the easily accessible community conservation practice of coral gardening. If done correctly, coral gardening can produce fantastic results, and I believe it to be the pro-active conservation strategy that will, through collective initiatives, provide a beneficial impact to the future of coral reefs globally.

Project REEFrame has adopted these methods as a part of a much broader conservation strategy, however it is vital to ensure the methodology and training are scientifically sound. We, as a collective of conservation minded divers must avoid improper practices. Improper methodologies, even when performed with good intentions, can have detrimental effects on the very reefs they are trying to conserve.

Marine conservation, and specifically coral reef conservation, is a very hot topic right now and rightly so. Coral reefs are incredibly important, and we should be talking about them and taking steps to conserve them. In recent years there have been ever rising numbers of conservation groups and dive centres implementing local initiatives all over the world. Coral "fragging" or propagation is a brilliant way of increasing the coral numbers on a reef and it works, if done with a scientific mindset and an understanding of the process. Not only that, it is an incredible way to drive community involvement, increasing education and awareness as a form of conservation. The analogy of coral propagation and terrestrial gardening is incredibly apt and one which I will draw upon throughout this article. Planting a rose bush is easy if you know what you're doing but we need to make sure we're not trampling the petunias in the process.

Coral gardening, like diving, needs training that is beyond the basics to ensure that it is done correctly. We have all seen "that diver" – all the gear and no idea, dragging their octopus through the coral before kneeling down to clear their mask and adjust their 12kg overweighting. Bad practices such as these are obvious to those who know and understand what they are looking at. However, it is not so obvious to the newly trained diver as they don't have enough experience to spot the errors, especially if their training has been insufficient. Like the new diver, when members of the public first take coral gardening courses, they don't know if the methodology the instructor relays is scientifically sound, or whether the instructor is qualified to teach it. I've been doing this for 17 years and have worked with coral for 12 of those, and sometimes seeing other projects being advertised on social media can invoke the same sigh as you experience seeing "that diver". Should "that diver" be told to never dive again? Of course not. Nor should the coral project leaders be told to stop; however, further training is heavily advised so that they can be green fingered divers rather than a green fingered menace.

MONOSPECIFIC REEFS & BAD PRACTICES

Coral gardening exploits coral's natural process of fragmentation and budding. Budding is the a-sexual replication process which allows a single coral polyp to develop into a coral colony. Coral fragmentation, which is the initial point of coral gardening, is a method remarkably like taking a cutting in terrestrial based horticulture. When a fragment of a coral colony is naturally broken off, if it falls on a stable substrate it can reattach itself and grow to form a new genetically identical clone colony. When the fragment falls onto sand, it can't attach itself and presents an opportunity for us to rescue it before it becomes covered

and dies. These fragments of coral can either be replanted directly back onto damaged areas of the natural reef or secured onto nursery table structures to create a stock of seedlings. This is like the use of greenhouses in a garden to raise young plants that will be planted out into the garden when they are large enough. Once the coral fragments reach a certain size, they can be replanted on a natural reef or onto artificial reef structures to extend the size of the reef system. This also means that when a reef becomes damaged, whether it is due to coral bleaching, a storm, anchor damage or a medley of other reasons, we can take these seedlings and plant them onto the damaged areas to rejuvenate, rehabilitate and restore the reef.

This process is very easy and gets divers involved to increase awareness of marine conservation issues, and in those regards it's great. Having a coral nursery or artificial reef full of corals as a product looks great for social media #Savetheseas #WooTeam #PatsOnHeadAllRound. The footage of flourishing nursery tables or artificial reefs can help to promote that conservation initiative. To the informed however, it's not so impressive when it is evident that the approach has been implemented without a scientific understanding of the process. Just like terrestrial gardening, coral gardening is easy, as long as you know what you are doing!

Unfortunately, there are multiple bad practices that are all too prevalent. A pressing issue is the sourcing of the fragments. Manually creating fragments by breaking a coral colony head, even if that head is healthy, does not create any genetic diversity. When a small number of corals is used to produce hundreds of coral fragments which are then out planted, those fragments create something called a monospecific reef with very little genetic diversity. Genetic diversity within a species is as important as the biodiversity within an ecosystem, as it signifies the health, the resilience, and the ability to adapt to change. Coral health can be described as its ability to survive, adapt and evolve, which signifies diversity on both a species and genetic level. A reef's ability to withstand and recover from disturbances relies on the coral health, diversity and abundance. A monospecific reef is not a healthy reef.

Coral restoration and conservation programmes which implement improper coral propagation methodologies may not be aware of the genetic implications of their practices. They are reducing the overall genetic diversity of corals on restored reefs, leading to reproductive failures, genetic bottlenecks and inbreeding. The short-term results of improper fragging may seem impressive and look great on social media, however they can create an environment of low genetic diversity, which doesn't end well. The Hapsburg's and the 8th Egyptian Dynasty were historically impressive, however in the end it didn't work out too well for King Charles II of Spain or King Tut.

Corals collected and propagated should be "fragments of opportunity" naturally broken fragments which otherwise would have little chance of surviving, not only that but the fragments should be collected from all over the reef, and if possible, from many reefs. The propagated species should also be diversified, its very easy to focus on fast growing corals, which is fine if that's factored into a long-term expansive plan, however it is detrimental if it is the sole focus of the project. Too often social media stories show appalling methods that are glorified as success stories. Large corals taken directly from the natural reef, planted permanently next to each other, hashtag look what we did. You would never take a chainsaw into a forest, chop down healthy mature trees and take them to a new site, then plant them and proclaim "look at the new forest we made", and yet we see it happening on a regular basis.

If you intended to plant a new forest, would you plant oak saplings permanently 5cm from each other? Hopefully the answer is no, as over time the sapling will grow into a huge tree, and it needs far more space to grow. At Project REEFrame we utilise coral nursery tables which are designed to nurture smaller fragments to a size that they can be safely out planted without damaging the corals. There are far too many projects showing corals that could grow to more than a metre in diameter which have been permanently planted adjacent to each other, because a densely planted reef looks good for publicity. The reasoning behind this is that short term impressive results, as false as they may be, help to secure future funding, because at the end of the day it's a business.

CORAL CONSERVATION AS A BUSINESS

The phrase coral conservation paints a picture of glazed eyed tree huggers ready to berate stakeholders on their bad practices, before asking for a cheque. The ideal of a utopian world where we can spend our time promoting nature and harmony is a fabulous objective, however at this point that idea is unfortunately still science fiction. Money doesn't grow on trees and coral doesn't grow on sand, you don't get rich or achieve anything by crossing your fingers and hoping for the best, just as coral reefs can't be conserved for the future by wishful thinking alone. How to achieve something? Work. How to implement active marine resource management techniques? Work. The phrase "marine resource management" when brought into the context of coral conservation, means defining coral as a resource, something with intrinsic value to stakeholders. When it has value it's a lot easier to talk the stakeholder's language and a lot easier to get things done.

Coral conservation or marine resource management has become a business, the end product of this business is to conserve coral ecosystems, however that means conservation of coral ecosystems has to be a valued product in itself, or alternatively a product that is used in that field. Commonly in the field of coral propagation we see "new" and "innovative" products with wild claims of improved performance and equally extravagant pricing, that are actually reinventing the wheel while making the process more expensive. To approach an accomplished gardener and proclaim his plant pots are old, saying "try this new diamond encrusted plant pot made from the finest unicorn horn shavings", it is likely he or she would politely tell you where you can put the plant pots.

The field of marine conservation isn't exactly flush with cash, limited funding and resources need to be allocated in the most efficient way in order to achieve the optimum results. If there is a cost-effective methodology or ocean friendly materials which are fit for purpose, those are the ones that should be selected, which is exactly what we do at Project REEFrame. Conservation projects need to avoid becoming sellers of magic beans, because at the end of the day all that will achieve is to dissuade stakeholders from future investment, cutting future funding.

THE LEGAL FRAMEWORK IN THE UAE

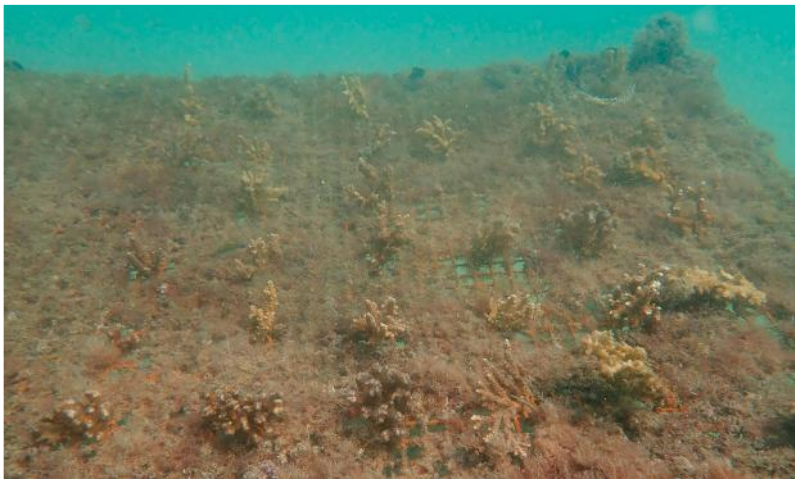
The UAE has a long tradition of nature conservation and federal laws have been in place since 1999, governing the practice of coral conservation and creation of artificial reefs. The Federal law No. 23 of 1999 states that "Artificial coral reefs may not be set up unless for scientific research purposes or for developing certain species of the living Aquatic Wealth and after obtaining a license from the Ministry and the competent authority."

The environment authorities in each emirate are responsible for issuing these licenses and over recent years there has been significant enhancements to the process that must be followed to obtain them.

Basically, if a project has not been defined scientifically, detailing objectives, methods, and materials, as well as the expected benefit to the environment, it is very unlikely to receive a license. The project and its projected impact must be detailed in an Environmental Impact Analysis written by an accredited marine environmental consultancy, accompanied by third party laboratory analyses of the water, sediment and infauna to form a scientific baseline.

The materials used for artificial reefs are particularly important, they must not cause any pollution to the environment over time.



Federal Law No. 24 of 1999 defines the characteristics and penalties for dumping polluting materials into the ocean.

The environmental authorities in the UAE have been focusing on ensuring that marine conservation projects are performed correctly, as well as introducing marine rangers to monitor activities in the ocean and ensure that unlicensed activities are curtailed.

Project REEFrame has passed through the licensing process and is the holder of a 3-year environmental permit for coral conservation issued by the Fujairah Environment Authority. We also have a 3-year partnership agreement with the Marine Environment Research Department within MOCCAE.

LONG TERM MONITORING

Robert Burns once wrote, "The best laid plans of mice and men often go awry" which as true as it may be, is still very defeatist, and similar to Murphys law, "anything that can go wrong, will go wrong". Maybe those best laid plans weren't the best plans after all? What to do? To give up is inexcusable, to persevere stubbornly is, according to Albert Einstein, the definition of madness, "The true definition of madness is repeating the same action, over and over, hoping for a different result". So how do we change that plan of mice and men?

Long term monitoring and research provides data for change, refining and optimising methodologies in order to achieve the goals desired. We need to collect data to identify mistakes so that we can learn from them and make appropriate corrections. Utilising scientific method to refine methodologies and then return to the proactive implementation of those methods achieves results. Monitoring those results allows for optimisation, however we must be very careful not to get trapped in an endless cycle of scientific method and academia, as sitting around discussing things forever like Tolkien's Ents doesn't actually get anything done.

In a field of very limited resources and funding, spending all your time collecting data and analysing that data detracts from the time spent actually doing the conservation work. Long term monitoring should be in place to define over time whether that production methodology is achieving the desired result, and should be holistic in nature. Project monitoring just as coral propagation, artificial reefs, ecological monitoring programmes need to be holistic, cumulative parts of a greater marine resource management strategy. Project REEFrame strives to ensure that the methodology is scientifically based and correctly implemented, as well as incorporating the holistic elements required to succeed in preserving and enriching the coral ecosystems. Through monitoring, education and experience we can strive to ensure that the best laid plans of mice and men, don't go awry.

In John Steinbeck's novel "Of Mice and Men", Lennie just wanted to pet the rabbits but unintentionally killed them by being too rough. Don't be like Lennie, if you want to get involved in coral conservation, learn how to do it properly so that you can do it responsibly. We all want to achieve the same thing: save our majestic coral reefs for future generations. Time is a valuable resource and if you wish to commit some of your time, then make sure it is not wasted and join Project REEFrame. Marine conservation is already perceived as nothing more than a drop in the ocean, although that can be countered by "what is an ocean but a multitude of drops". Cumulative local initiatives form a global initiative; however we must make sure that the local initiatives are contributory rather than detrimental.

AI IN THE DIVING WORLD

FEATURE **PATRICK VAN HOESERLANDE** IMAGES **IVO MADDER**

The use of Artificial Intelligence (AI) in diving is still relatively new, but it shows promise in several applications.

Somewhat by chance, on a quasi-grey evening, I am sitting at a table with two data specialists. After exchanging the usual pleasantries and niceties, we discover that all three of us have a passion for diving. Well, you can hardly call something like that a coincidence. After we get to know each other's preferences in terms of diving equipment and profiles, an interesting conversation unfolds about the future of diving.

We decide to extrapolate on how we will go underwater in say 10 to 20 years. How will technology change our sport? The following is a summary of our conversation.

WHAT WILL THE FUTURE BRING?

The future of SCUBA diving looks bright, as there are several trends and developments that we are expecting to shape the industry in the years to come. Here are some of the most significant ones:

- **Sustainable Diving:** With growing concerns about the impact of human activities on the environment, many divers are seeking ways to make their dives more sustainable. This includes using eco-friendly equipment, supporting responsible dive operators, and being mindful of their underwater behaviour.
- **Technical Diving:** Technical diving is becoming increasingly popular as more divers seek to push the limits of their equipment and skills, and as technical equipment becomes more user-friendly. What used to be technical (e.g. a rebreather) is increasingly becoming 'quasi-recreational'.
- **Underwater Drones:** Underwater drones are becoming more advanced and accessible, allowing divers to explore the seas in new ways. These devices can be used for tasks such as underwater mapping, marine biology research, and even recreational exploration.
- **Accessibility:** Efforts are being made to make diving more accessible to a wider range of people, including those with disabilities or mobility issues. This includes specialised training programmes, adaptive equipment, and dive centres that cater to the needs of diverse communities.

But with progress comes a need to integrate different systems and technologies into a single platform to tame complexity. Key to unlocking the potential of this integration are powerful computers. These computers can process substantial amounts of data in real time, and are used to monitor and manage the diving environment. With more powerful computers, it is possible to create an integrated system that can monitor and control various systems, from navigation, propulsion, balancing and communication to oxygen levels and dive profiles.

Besides powerful computers, the development of a very compact energy source is another key factor to realise the potential of integration. This energy source should be able to power the various systems and technologies used in diving without compromising safety or performance. The promising development in this area is the development of fuel cells.

By combining different systems, the complexity of the diving environment can be reduced, and divers can concentrate more on their surroundings. This allows divers to access data from different sensors and cameras, allowing them to monitor their environment in real time. This potentially has several important implications:

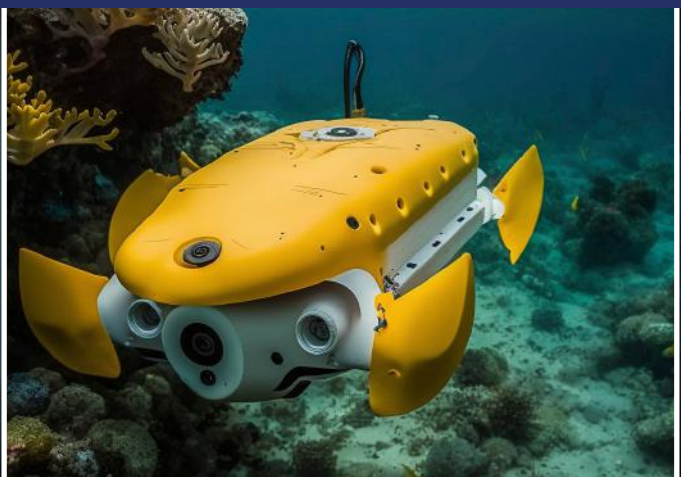
- **Longer Dive Times:** Compact power sources allow divers to stay underwater for longer periods of time as they can power advanced equipment such as underwater drives, communication systems, and lighting for longer.
- **Enhanced Safety:** Powerful computers are being used to develop sophisticated diving algorithms and monitoring systems that can help divers avoid the risks of decompression sickness and other diving-related health issues. Additionally, computerised rebreathers can automatically adjust the gas mixtures to maintain safe oxygen levels and extend bottom time.
- **Advanced Imaging:** Powerful computers are also enabling advances in underwater imaging, with software algorithms that can correct distortion, improve image quality, and process large volumes of data.
- **Navigation and Mapping:** Compact energy sources are also powering advanced underwater navigation systems and mapping tools, including handheld sonars, and underwater cameras. This technology allows divers to explore new areas and gather more data about the underwater world.

Nanotechnology, the manipulation of matter at the atomic or molecular level, is another area of development that could radically change diving. One of its most promising applications in diving is the development of nanomaterials. These materials are incredibly light and strong and can be used to produce more efficient and durable diving equipment. They can also be used to make sensors and cameras that can detect and measure all kinds of parameters in the underwater environment. Similarly, nanotechnology can be used to develop a new type of propulsion system that is more efficient and powerful than traditional systems.

Although oxygen can be extracted from water using electrolysis, the energy required to do so would be prohibitively high, even with our compact fuel cell. Filtering oxygen from water is a possible application of nanotechnology, but this is not currently feasible. If this nanofiltration becomes possible then, in combination with a rebreather, it would revolutionise diving, as divers could then stay underwater virtually indefinitely.

Communication and navigation are essential for safe and efficient diving. In the past, these systems were bulky and inefficient, but in the future, integrated communication and navigation systems can be developed that are more efficient and powerful. In what ways could underwater navigation be improved?

- **Underwater GPS:** The development of underwater GPS (Global Positioning System) technology is making it easier for divers to navigate underwater, much like they would on land. Using acoustic signals from underwater beacons, GPS can provide divers with precise location information, which can help them to navigate to specific points of interest.
- **Sonar Technology:** Sonar technology, which uses sound waves to detect underwater objects, is becoming increasingly advanced. Doppler sonar, for example, can detect changes in water currents and provide



divers with real-time data about their surroundings.

- **Imaging Technology:** Advanced imaging technology, such as side-scan sonar and 3D imaging, can provide divers with detailed maps of the underwater environment. This technology can be used to identify underwater features, such as caves, wrecks, and reefs, and can help divers to navigate more accurately.
- **Heads-up Displays:** HUDs are becoming more common in diving masks providing divers with real-time information on depth, heading and other important features. This technology combined with Augmented Reality (AR) can help divers orientate themselves even in poor visibility. An open architecture HUD can combine information from multiple sensors and systems, creating a more streamlined and efficient system.

The use of Artificial Intelligence (AI) in diving is still relatively new, but it already shows promise in several applications. Here are some examples:

- **Diving Safety:** AI can be used to analyse data from dive computers and other sensors to identify potential safety risks, such as changes in breathing patterns or oxygen levels. This can help divers to avoid dangerous situations and prevent accidents.
- **Marine Life Identification:** AI can be used to identify different species of marine life from underwater images and video footage. This technology can help divers to better understand the ecosystems they are exploring and contribute to conservation efforts.
- **Underwater Mapping:** AI can be used to create more detailed maps of the underwater environment, which can help divers to navigate more accurately and identify areas of interest. This technology can also be used to monitor changes in the marine environment over time.
- **Diving Gear Optimisation:** AI can be used to optimise diving gear (in real time) for individual divers, considering factors such as body type, diving experience, and environmental conditions. This technology can help to enhance comfort and safety while diving.

AI has the potential to revolutionise the industry by improving safety, enhancing the diving experience, and contributing to conservation efforts. As technology develops, we will likely see more applications of AI in diving in the future.

We conclude by consensus that sport diving will continue to be an exciting and rewarding activity. With advancing technology, diving is likely to become easier, safer and more accessible than ever before. However, it is important to remember that diving will never be completely risk-free and it is crucial to prioritise safety and education at all times. By staying well informed, taking the necessary precautions and respecting the underwater environment, divers can enjoy this incredible activity while minimising risks.

It is already close to midnight when I say goodbye to my two table partners. This conversation has given us a good idea of what to expect. Looking at the list, it strikes me that there are no real surprises. Rather, they are extrapolations of current trends into the next decade. Still, the future of sport diving looks bright.

EPILOGUE

To attentive and news-loving readers, it is obvious that my two interlocutors are AI robots. During an editorial meeting, the idea grew to test the latest hype and see if these AI writers could replace us as writers. The photos accompanying this article were also created using AI.

The first, OpenAI's ChatGPT, is the better-known of the two and a 'chatbot' that likes to engage in conversation. Unfortunately, this AI has not been fed since September 2021, so its 'knowledge' is not increasing, and it cannot provide answers about facts after this date. The second, WriteSonic's AI Article Writer 4.0, focuses on article writing. This article came about by giving both robots similar input based on an old article with the title 'A History of Scuba Diving – Past, Present and Future' (see the March 2014 edition).

This brief experience taught me that writing an article with AI still takes a lot of time. After all, these robots are not creative. This is still a human trait. AI simply builds, a euphemism, on what already exists, on what the learning software was/is fed with. An AI article based purely on what all the AI robots in the world have written would just be a boring mess. Not worthy of your cranial activity unless before going to bed. I was the creative glue by feeding the two systems a title and a list of keywords, and finally mixing the two artificially created stories in a setting of a table conversation to make the whole thing a bit lively. The original text looked more like a Wikipedia entry.

Another problem is that it's hard to figure out where the AI got its wisdom. Is what you read the truth? No problem if you fantasise about the future, but if you want to keep in touch with reality, you're walking on thin ice. AI can blather, and wrap it up nicely too.

But technology does not stand still, because Microsoft, for instance, is busy integrating artificial intelligence into its search engine, Bing. To do so, the software company will use technology from OpenAI, the company behind the much-discussed ChatGPT bot. Moreover, the language model will be more advanced than ChatGPT's and will allow for the inclusion of references where the info was found.

So, are such Chatbots a waste of human potential? No, they can be fun. For instance, one of our sons had his life story sketched by ChatGPT. Hilarious! They are also excellent tools for starting a story. After all, they never have a writer's block. As a writer, they can also help you improve your text. QuillBot, for example, is an excellent tool that uses AI to rephrase your text but does not add anything new. However, they are just machines, tools, based on what other (hopefully) people have written and thrown on the internet. They do not yet replace journalists or editors.

The future of writer-divers looks bright. At least in 2023 anyway.

RESOURCES
OpenAI ChatGPT: www.openai.com/blog/chatgpt
WriteSonic AI Writer 4.0: https://app.writesonic.com/
QuillBot: www.quillbot.com
Image Generator DALL-E 2: www.openai.com/dall-e-2
Image Generator Midjourney: www.midjourney.com

MY JOURNEY TO -308M
A NEW WORLD RECORD IN CAVE DIVING

FEATURE **FRÉDÉRIC SWIERCZYNSKI** INTERVIEW **FRANCIS LE GUEN**
PHOTOGRAPHY **LAURENT MIROULT**, **FLORIAN LAUNETTE**, AND **ALEXANDRE LEGRIX**

There is a new cave diving exploration world record. During an epic 7 hours dive in the Font Estramar of the Eastern Pyrenees, speleonaut Frédéric Swierczynski from Marseille reached an astonishing depth of -308m!

Photo by © Alexandre Legrix – Ressel.

Photo by © Alexandre Legrix – Port Miou.

There is a new cave diving exploration world record. During an epic 7 hours dive in the Font Estramar of the Eastern Pyrenees, speleonaut Frédéric Swierczynski from Marseille reached an astonishing depth of -308m!

I am below 260 metres underwater; my discomfort in my eye finally stops, and I can see clearly. I decide to make a quick assessment of my situation: I am conscious and choose to continue moving forward while laying the line. A vertical shaft appears, and I can see the gallery continuing to descend even deeper. The tunnel, made of scoriaceous rock, is vast and disappears into the darkness. I'm the first person here, alone. I drift into the blue night, with the only point of reference being the sound of my breathing roaring through the canisters of my rebreather and the motor of my DPV. I feel good, extraordinarily lucid.

I secure the line to a carved stone; my hands tremble not only with excitement but also due to symptoms of 'HPNS,' the dreaded high-pressure nervous syndrome. Despite this, I continue feeling liberated in this immense aquatic clarity. The atmosphere is otherworldly. I pass by a bed of sand, rippled by the current. Ahead and below me lies a vast and expansive chamber. Glancing at my timer: 400 minutes of decompression… Fred, it's time to head back! I'm 50 years old, and today I've reached a depth of 308 metres, setting a new world record. Yet, at this moment, I haven't fully comprehended it. I've never been one to base decisions solely on numbers; for me, it's about the experience, the sensation, the feeling… something exciting.

Salses le Château, 3 November 2023: At the edge of the Font Estramar spring – T minus 10 minutes before the start of the dive.

It has been an almost sleepless night. I managed to grab some sleep, but my dreams lingered. The same recurring images, nothing really new. For at least two weeks, my nights have been consumed by meticulously replaying every gesture, every second of that dive. Living on credit in the deep darkness, optimising every instrument control, visualising myself navigating the distant gallery, relying on that precious yellow guideline…

Beneath the tranquil, transparent blue surface, green algae sways, revealing the current emanating from beneath the earth. Where does this mysterious river originate?

As I prepare my equipment by the spring's edge, attempting false cheerfulness, I engage in conversation with veteran deep divers who have come to lend their support. We reminisce about the heavy, open-circuit diving operations from just a few years ago, involving dozens of tanks and days of preparation, contrasting with how I now manage it all in just 20 minutes!

I reminisce about the past few months: the endurance races in Marseille's Calanques, hours of breathless exertion on the slopes, kilometres traversed through pine forests, scrublands, and rolling limestone scree. And then, the countless deep training dives, here in the warm waters of the Catalan country, plunging down to the -260m zone. These dives aimed to acquaint myself with the underwater topography, navigating the flooded gallery stretching over a kilometre, and perhaps to acclimatise both body and mind.

I meticulously refined my decompression curve, aiming for the most precise adjustment possible: minimising dive time without compromising safety. I adapted my equipment in minute increments, striving to merge seamlessly with the environment, making its challenges my own. Unbeknownst to my conscious self, my body had already made the decision to venture into the unknown, beyond the -300m mark.

T 0 – HERE WE GO!

The DPVs and rebreathers are submerged, meticulously set timers syncing with other divers joining me at the -120m decompression

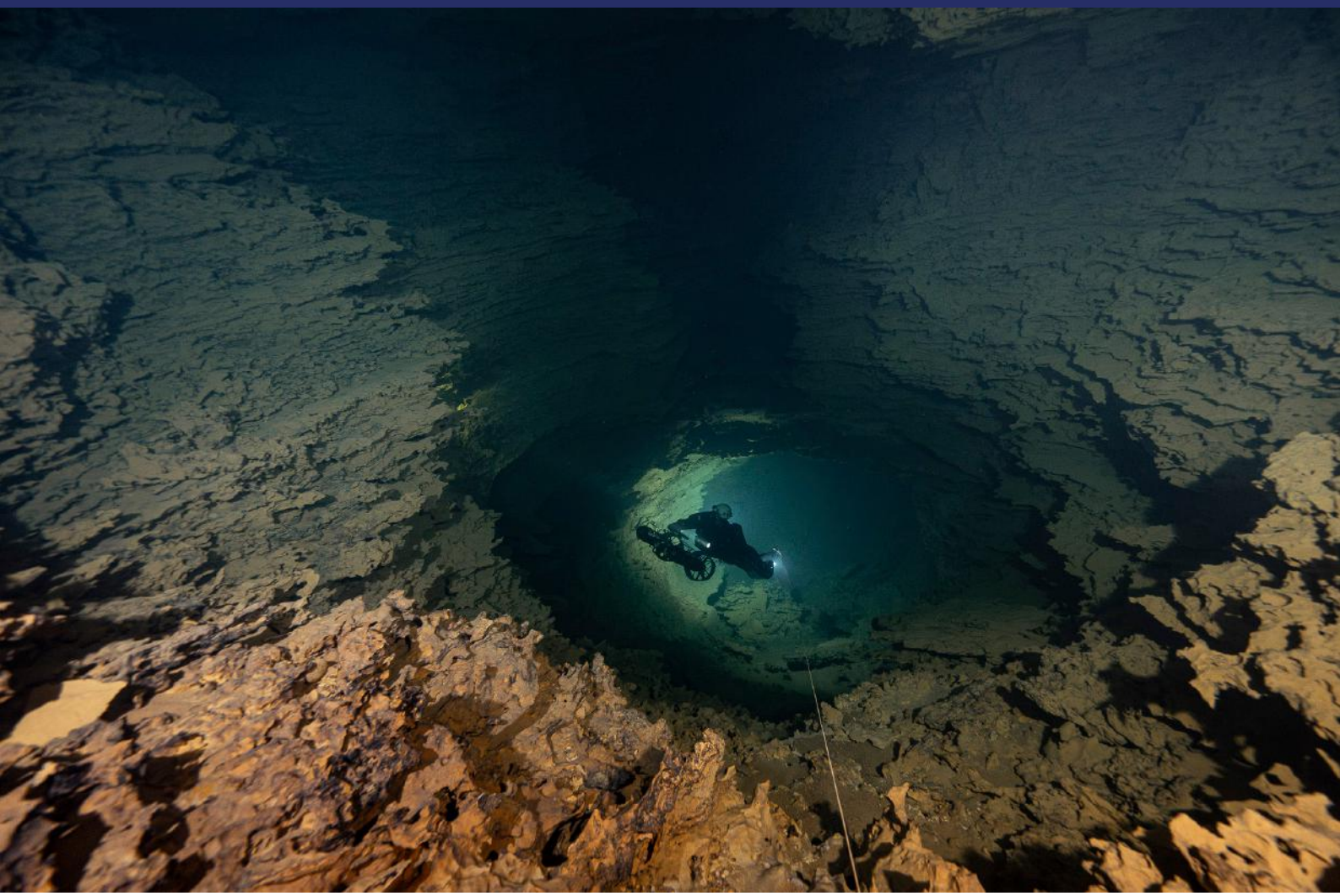


Photo by © Alexandre Legrix – Ressel.

stops. Heated underwear, drysuit – getting help to seal it while I adjust equipment in the water basin, my body halfway submerged. Harnesses, fins, rebreathers – a ritual repeated over the past few months. I cannot afford to overlook anything; it's all going to happen in a flash. Each piece of equipment must respond instantly to my needs. The mask – a precious necessity. I rinse it, adjust it meticulously, and then I'm off.

The aquatic horizon appears blue, kissed by streaks of sunlight. A black archway reveals itself within the gray rock. I descend into the vertical shaft that follows, allowing myself to be swallowed by the night. Equalising my ears, ensuring the drysuit fits snugly, rebreathers' lungs emptying, the hiss of the inflators – a battle against pressure unfolds!

The DPV propels me into the submerged gallery at over fifty metres per minute. I seize the moment to glance at the rebreather displays, checking the partial pressure of the oxygen mixture I'm breathing. It's crucial information. I can't divert my eyes from these indicators; it's the only way to prevent potential poisoning.

T+5 MINUTES – ON THE WAY…

My vessel maintains a steady cruising speed, led by a Seacraft scooter ahead, towing me while another serves as a backup, secured to my back. My headlights pierce the distance as the crystal-clear water reveals passing walls. The automated control of my instruments is in place. I navigate above the guide cord installed in the main gallery, beneath the vaulted arches stained with iron and manganese oxides: hues of rust, brown, yellow ochre, deep black, and red clay. Eroded mineral structures sharp as razors intersect secondary galleries, and the current's direction occasionally plays tricks on us.

Font Estramar resembles a complex labyrinth of corridors and dead ends, where losing your way is not an option. I await Patrice Cabanel, following me on his double DPV. He speeds past me, diving much deeper into the expansive vertical well to capture a few videos as I continue my journey.

T+8 MINUTES – JUMP.

Descending 60 metres. The actual dive commences. Final checks precede the big jump: activating the powerful dive lights and starting up all equipment that will encounter pressure at depth. It's the last feasible moment before the impending darkness… I prepare myself – it's time to jump!

T+10 MINUTES – AROUND -200M…

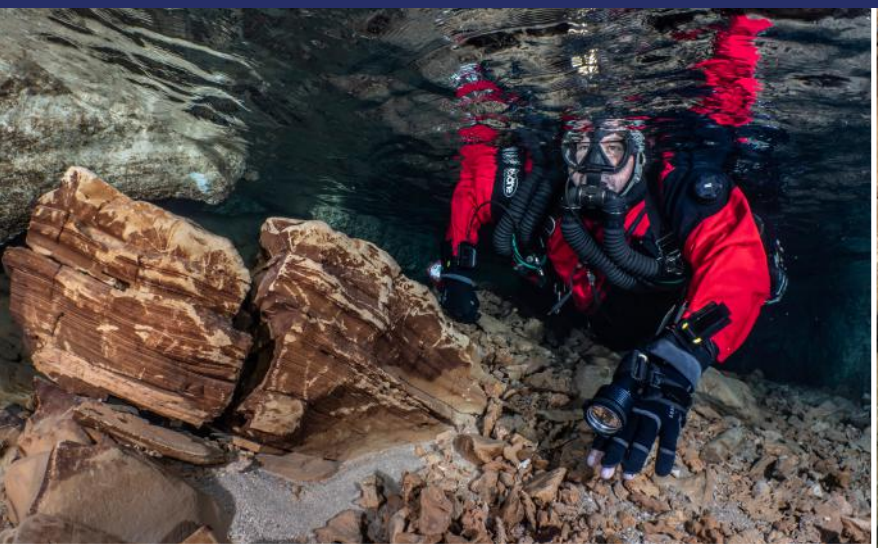
At -100m, I meet Patrice, camera in hand, eagerly awaiting my arrival. He joins me in the descent! -150m, -170m: we accelerate! Swiftly. Perhaps too fast. Like two bikers racing on a vertical track, each trying to outpace the other… He remains close behind, but the maximum test depth of his scooters becomes critical at -180m.

I signal to halt him – I don't want his vehicle to implode under the extreme pressure! The memory of the Finnish diver torn apart by his scooter lingers in my mind; I was there to investigate the accident at the request of French authorities. His body remains in that cavity, now his underwater tomb, buried beneath 200 metres of water. I continue my descent, the haunting echoes of crazy organ music reverberating in my head.

As Patrice Cabanel recalls: "What's just a little over halfway for Fred, represents an immense leap for me. I'm at a depth of 190m, watching him sink further. It's surreal, seeing him surpass 200m and vanish from my sight…"

T+14 MINUTES – DAZZLED.

As I continue my descent, the rock formations become lighter, indicating a shift in geological layers – it's as if I'm travelling back in time. I'm approaching the horizontal section of the tunnel, fluctuating between -250m and -260m – a familiar place from my numerous training visits. A round trip usually adds an extra hour to my decompression, but today, I anticipate it'll be much longer as I'm going deeper.



L-R: Photo by © Laurent Miroult.

Reaching the bottom of the well at -260m, I stand up and suddenly experience an unfamiliar discomfort: a dazzling sensation. The floor of the submerged horizontal gallery appears flooded once again; it's like an illuminated sea, shimmering with reflections. I move forward as if in a dream, feeling disoriented.

In the professional field, a compression at -300m considered 'quick', takes… 24 hours! However, there are challenges associated with compression in a bell or diving box, particularly the gas heating issue, which needs time to cool. Such problems aren't faced by a scuba diver underwater. But today, this isn't just training. The quick descent with Patrice has likely accelerated my usual speed. I may be paying the price for it now.

T+16 MINS – HIGH PRESSURE NERVOUS SYNDROME.

The discomfort dissipates as abruptly as it arrived, and my vision returns. It seems my horizontal journey to the lip of the terminal shaft has revitalised me. Ahead, a black abyss. No more lifeline! I must secure my own reel and ensure the line's safety. My hands tremble… HPNS, it's not uncommon. Over more than 12 years of deep dives below the -200m mark, it's become a familiar companion, no longer surprising me.

T+? MINUTES – SLEEPWALKING.

I've lost track of time; I'm in a state of ecstasy. The moment I've waited for, perhaps more than 6 months – or is it 20 years? – has finally arrived. My scooter's at a low speed, the yellow line unwinding steadily, and my body's 'trim' is perfect. Balance and positioning in this liquid realm are crucial for survival; they minimise physical exertion and, consequently, metabolism. With wide-open eyes, I absorb the unknown surroundings passing by me; the receding blue horizon guides my progress, gestures, and decisions. Now, it's the exploration itself that drives my dive. I glide into an increasingly expansive chamber, drawing me in toward my destiny.

Visibility extends beyond 25 metres! My sight loses itself in the blue transparency that transitions into blackness. It's majestic, truly majestic.

I keep a vigilant eye on my line, ensuring it doesn't snag in the narrow sections of the gallery. I leverage my optimal mental state to capture these envisioned magical moments – moments that are now mine. Another line splits on a sharp rock beneath me, and my computer alerts me: 400 minutes of decompression already! It feels too brief; I yearn to continue. It's a struggle to break free from the allure of unexplored depths. I hasten. Every passing second is crucial at these depths. I decide to secure my reel, leaving it to mark my terminus. A nod to Krzysztof Starnawski, another deep diver, who had abandoned a reel at the bottom of the magnificent Cetina spring in Croatia – an artefact I had retrieved during my initial dive there.

I propel toward the distant surface. My ascent is swift. Eager to detach from the abyss and commence decompression. It's happening way too fast, and the cost will be high, though I'm unaware of that yet…

T+28 MINUTES – JUNCTION!

Arriving early at the first stage at -130m, I commence following the deco stops. It's at -90m where Bruno, the support diver, finally joins me. Finally, I have access to all my measuring instruments. And there, I discover the incredible depth I've reached: -308m! Typically, during these deep dives, I initially monitor my condition, followed by the partial pressure of oxygen, the 'run time' – the diving time – and the expected duration of the stops. Depth becomes secondary… I don't fixate on it. If my body signals approval, I proceed. There wasn't any distress; it was the constraints of decompression time that compelled me to turn back.

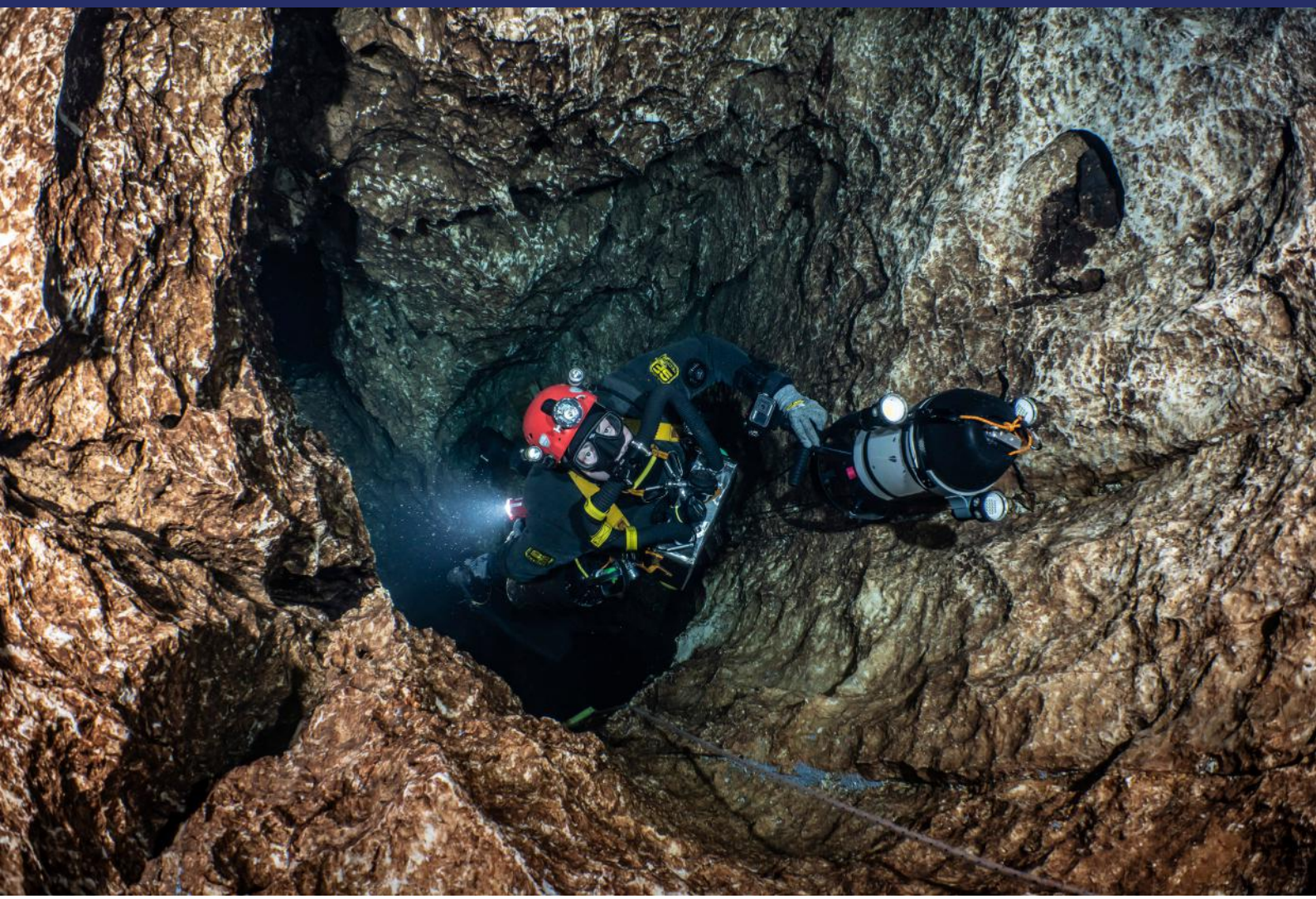


Photo by © Laurent Miroult – Font Estramar.

T+40 MINUTES – I CANNOT BREATHE ANYMORE!

We're swimming towards the -80m level when I suddenly encounter extreme difficulty breathing – my rib cage feels constricted! My lungs seem blocked, my upper body trapped. Gas poisoning? Swiftly, I switch the rebreather tip, yet to no avail. It's not gas toxicity; the issue lies elsewhere. Faced with this unknown, fear lingers, but panic is unattainable. I must rely on my wisdom and experience… I try 'stomach breathing,' as in training. Laboured. Like sipping through a straw. But even with limited ventilated volume, it suffices. Minutes tick by… Bruno remains by my side, watching over me for four hours.

Worse still: a sharp pain grips my back. Alongside breathing difficulties, an oppressive sensation prevails – as if my suit is being crushed, the metal plate of my harness weighing tons. This ordeal extends for over an hour. It's only upon reaching the 30 metre mark that the grip eases, and I finally experience liberation. I inhale. I am alive. I remember…

During the debrief with Bernard Gardette, director of deep dives and extreme environments at Comex – responsible for Théo Mavrostomos' legendary -701m dive – I learn that the visual illuminations I experienced are symptoms of HPNS. Tremors are more common. The spectrum of detrimental effects from neurological damage due to pressurised helium remains understudied. Reports mention vomiting issues. Thankfully, I escaped that underwater. These are irksome but reversible physical conditions, leaving the intellect unscathed.

However, the respiratory oppression appears linked to a massive helium outgassing from my too rapid ascent. Circulating bubbles that I gradually eliminated from my lungs, yet symptoms of spinal cord and kidney injury persist. The spinal cord – a risk of permanent paralysis…

Indeed, our computers are programmed to warn against rapid ascent. However, I've grown accustomed to my personal calculations and procedures, ignoring these warning bells, letting them ring out. Who's the boss here? I've grown accustomed to their persistent tunes, like a man at home ignoring his wife's shouts…

Gardette confirms that we can ascend rapidly from -300m to -200m, but it's crucial to slow down before the first significant deco stop! Valuable information that I'll heed for my upcoming dive in the terminal well of the Mescla cave in the Var gorges.

T+120 MINS – THE MOTIONLESS JOURNEY.

Franck joins us at a depth of 50m. It's time to jot down a message, a simple wet sheet of paper destined for other divers higher up and the surface. It reads: 'Fred -308m all is OK'…

Many hours still separate me from the surface. I'm doubly confined: in the flooded gallery and by this physiological limit preventing me from directly ascending, risking a severe or even fatal decompression accident.

I float, entering a 'degraded phase,' almost in a drowsy state. It's about aligning my physiology to its vital minimum, merging with water effortlessly. Listening to time stretch and dreaming of what lies beyond…

T+200 MINUTES – LEAK…

As I approach the bottom of the exit shaft, daylight becomes visible from afar, urging me to scream. But at the -12m stop, a new alert emerges: a distinct sensation of fluid loss, from hip to foot. It feels as though I've urinated in my drysuit, an eerily realistic sensation sparking doubts. A slight movement reassures me – my leg functions properly, and I remain dry. However, the 'leak' persists, an unending 'bladder' sensation. Gardette later attributes this to 'skin sensations,' a decompression-related phenomenon sans gravity.

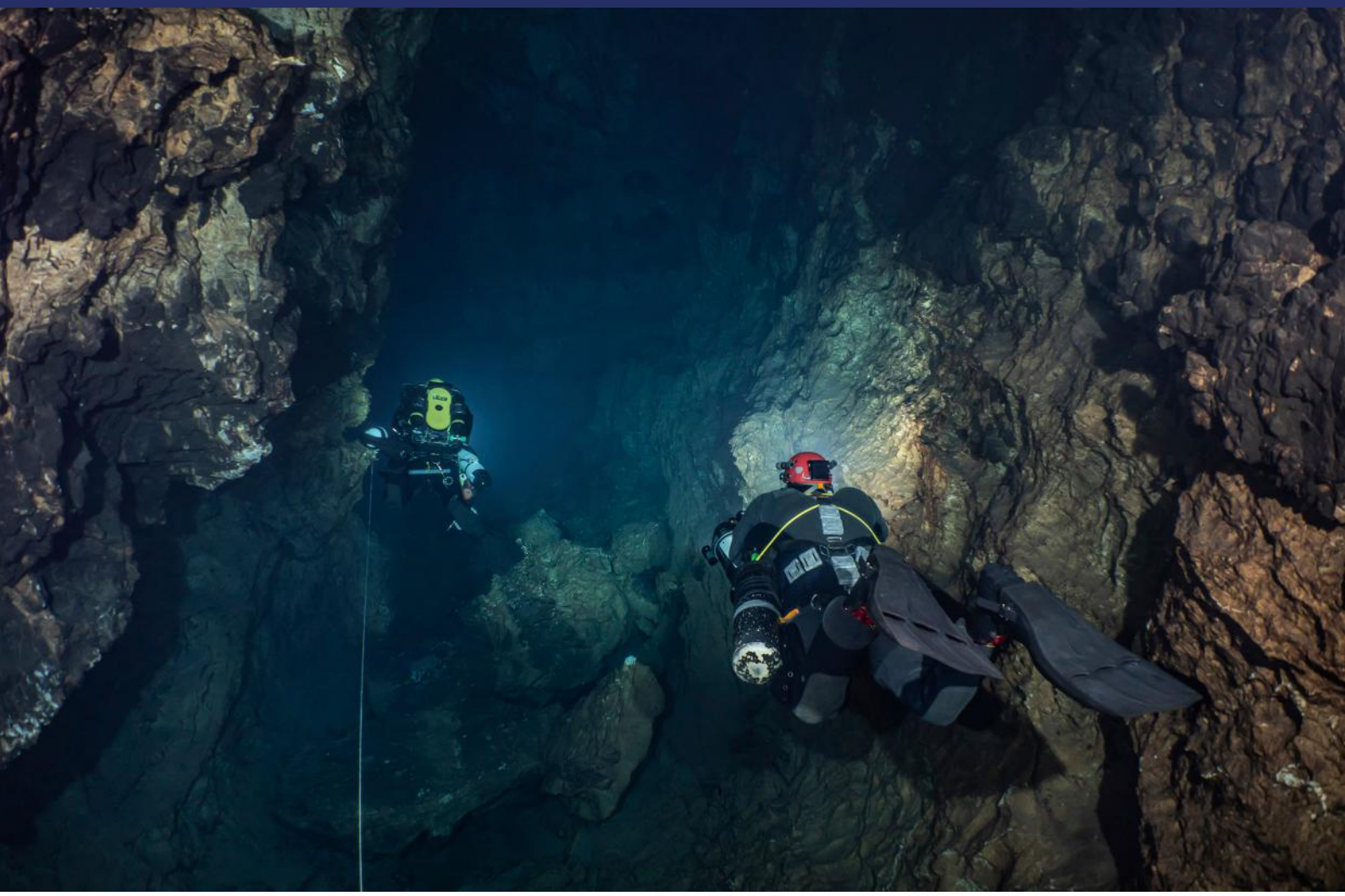


Photo by © Laurent Miroult – Font Estramar.

9m. The bell! I could conclude my decompression here, in dry comfort with legs in the water. Yet, I opt to forgo it. Changing the setup – a complete shift of environment, positioning, and potentially obstructed blood circulation poses risks. So, I remain horizontal, weightless, in a daze, choosing optimal decompression. I float serenely, a weightless entity within my rocky vessel, content and almost at ease.

Adjusting my heating: despite the relatively warm slightly brackish water at 18/19°C, the risk of cold remains due to immobility and stronger currents in this convergence point of the fountain's galleries.

Life teems here! Curious eels navigate among my equipment, while silver mullets dance in the sun. At minus 6 metres, filamentous algae drape and twist like theatre curtains, mingling with lignite roots and reed beds.

Time for a snack – my Catalan country apricot compote bottles provide an unexpected energy boost. A realisation strikes: dehydration likely plagues me, a negative factor for decompression. I'll need to remember to hydrate more during future attempts.

Nearly 7 hours underwater, helium gradually dissipating from my body, the surface is tantalisingly close. I observe it, a reflective mirror above me. With humility, I reflect on this new milestone in exploration – a paradigm shift challenging established beliefs, a leap forward for the entire community.

Our exploration endeavours always build upon past achievements. I think back to our pioneering elders, those who steadily dismantled psychological barriers. This marks a new frontier, a plank thrown into the swamp, paving the way for further progress. The great speleonauts all took this leap. It was time for me to do the same. I feel a sense of pride in these moments of pure beauty, in claiming a few dozen metres from the unknown, and in being able to recount this tale.

T+419 MINUTES – SURFACE!

I break the surface, lowering my mask and hood. There are splashes, silver droplets, laughter – sounds from the outside world; the smiles of friends. And the unmistakable scent of life…

MY EQUIPMENT

Throughout my dives, I have selected and tested a whole range of equipment from the best European manufacturers. Above all, those able to function and withstand the significant pressures of the depths that I need to get to at >300 m.

THERMAL INSULATION

Drysuit: Ursuit (Finland).
Heated Underwear: Santi (Poland).

I regulate the heat provided by the Seacraft DPV batteries.

BUOYANCY

Thanks to the harness XDeep (Poland) and the "Sidemount" configuration of my rebreathers, I obtain perfect trim with a minimum of ballast. I dive without a buoy, using only the inflation of the drysuit for balance. If unfortunately one of my rebreathers were to flood, making my weight negative and dangerous, I would just have to unhook it and leave it there.

BREATHING

THE REBREATHERS

2 closed circuit rebreathers (Czechia) worn sidemount. I breathe on the main (degraded), fixed on the left side, while regularly testing the backup (redundancy) on the right side. The latter is more flexible when breathing due to the position of the inspiratory lung, closer to the body. Filters modified in size, each allowing a duration of 9 hours in C02 purification. With an autonomy of 9/10 hours per rebreather.

GAS

Trimix 4/89 mixture (Oxygen, Helium, Nitrogen).

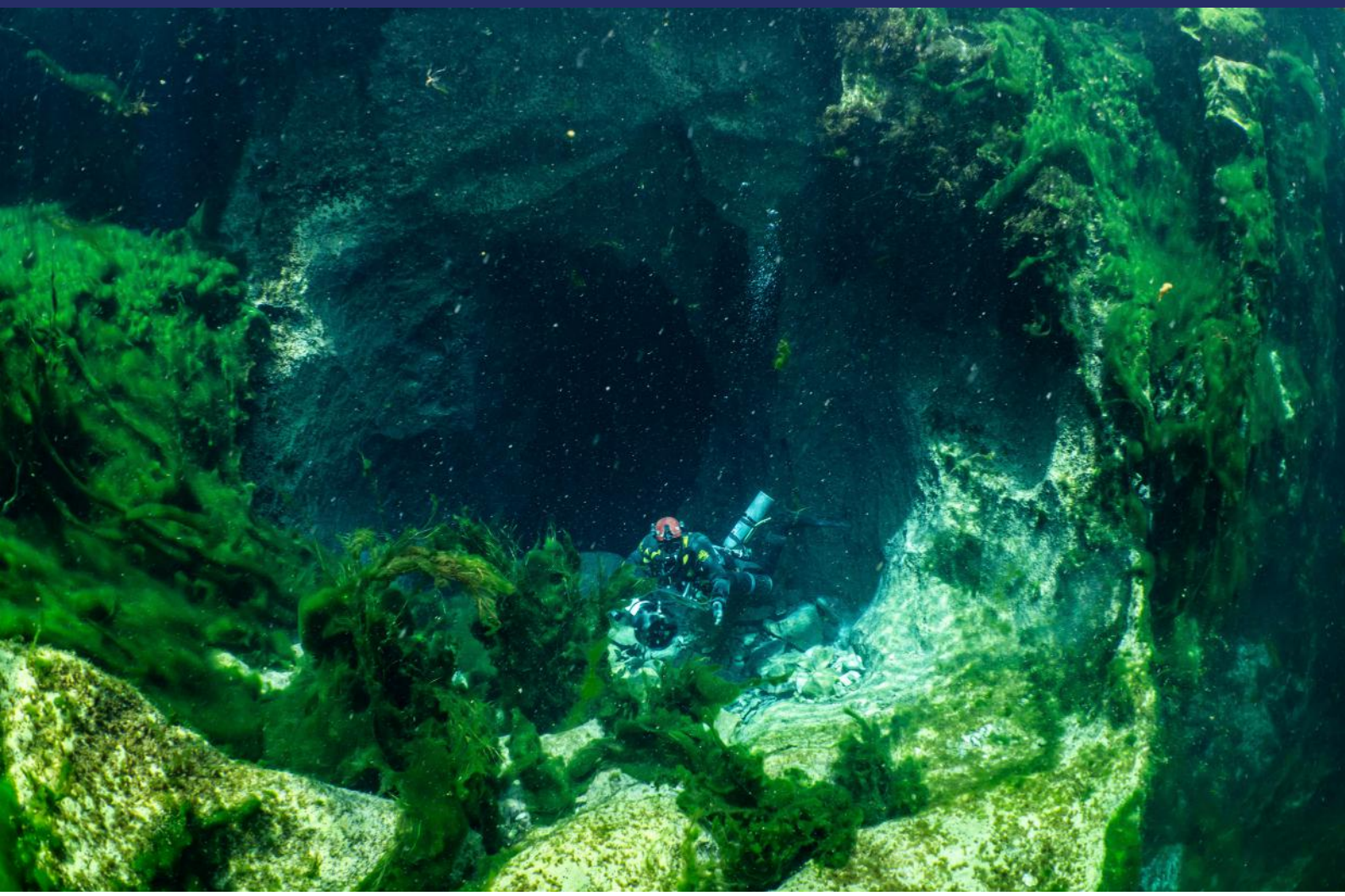


Photo by © Laurent Miroult – Font Estramar.

TANKS
Each rebreather included 2x2 litre tanks (pure oxygen and diluent) to which I added a 2 litre tank of compressed air at 374 bars for inflating the suit and another 2 litre tank of 4/89 diluent (off board) to compensate the too low autonomy of the big deep rebreather. A total of 6 tanks.

DECO
2 computers (Czechia), modified Buhlmann algorithms, independent and supportive of each rebreather.

PROPULSION
2 scooters Seacraft Ghost (Poland). Pressure test >300m. Multi-speed. More than 10 hours of operation for 30km of autonomy. Also serves as a battery for heating. Supports main lighting and an inertial measurement console. Designed to operate coupled, I separated them, keeping one as a backup fixed behind me so that I could have one hand free when navigating.

VISION
2 main lights of 50,000 lumens each attached to the front of the scooter. I am the designer and manufacturer of them with our brand Callisto (France).

One front light, Phaeton (Greece) attached to the helmet. 10 hours of autonomy at 20W adjustable to be able to illuminate the near field, the hands during reel manoeuvre (French technique).

One light, Tillytec (Germany) fixed on the arm: 2h at 4200 lumens.

DATA
Navigation Console: ENC 3 Seacraft (Poland). It is an inertial unit which allows the position in space to be recorded, coupled with a "loch top" as in sailing, with a small propeller allowing the displacement to be recorded.

IMAGES
Camera Housing: Isotta (Italy) worn on the head.

MISCELLANEOUS
- Several tools and cutters.
- Harness and buckles.
- Fins, emergency equipment (mask, etc.), lighting and comfort.

DECOMPRESSION
Individual deco bell installed at -9m. Scalable up to -6m. Fixed by cables on the bottom with ballast or bolts (expansion bolts). Done in a sitting position, with legs in the water. Homemade. 2x4 hours of oxygen autonomy per open circuit cylinders.

GAS MIXTURES AND CONSUMPTION
MIX TYPE
I use Trimix. For this dive, 4/89 that I prepare myself. Why Trimix rather than Heliox? I did some tests, but the Trimix is much more "comfortable". In addition, the presence of nitrogen in the mixture would limit SNHP (high pressure nervous syndrome) thanks to the narcotic effect of nitrogen. I use a low percentage in mixtures (between 7 and 10%) to avoid narcosis and limit nitrogen saturation. For this dive, the compressed air nitrogen equivalence corresponded to -30m. The isothermal performance is also better.

What about the use of Hydrogen as a diluent in deep diving? The Australian, Richard Harris successfully tested it while exploring the Pearse River in New Zealand. It's innovative and maybe it's the future? We are indeed "test divers". But there is not enough perspective on decompression. According to Bernard Gardette of Comex, who had successfully completed the first very deep dives with this gas, the decompression algorithms for Hydrogen are modelled on those used for Helium and this would therefore bring nothing in terms of diving time.

Above all, there is a serious safety problem: mixed with Oxygen, Hydrogen risks reacting explosively to… water! It's an unstable mixture

LEFT: Fredéric Swierczynski. **RIGHT:** © Florian Launette. Port Miou. France

that requires rigorous industrial procedures.

MAKING THE MIXTURES

Starting from B50 industrial bottles of pure gas, with the usual procedures. First, I transfer the Oxygen, then the Helium, then I add air. At all times I check the O2 level with several instruments and my spreadsheets. Next comes the overpressure procedure to fill the diving tanks with a booster MPS Technology of 380 bars, by an Italian company that has been following me for a long time.

GAS RECYCLING & DECARBONISATION

2 sidemount rebreathers with 3kg "Sofnolime" filters. I had to change the size of the original filters to much larger models because of the depths reached. Otherwise, the gas risks not having time to travel through the loop correctly: I risk breathing unfiltered gas and getting CO2 poisoning! I was inspired by what the US military had developed for their dives beyond 200m. Comex safety rebreathers too… with implications in terms of respiratory comfort and weighing. I had to acclimatise myself and adapt my technique accordingly.

Note that the descent is so rapid that I directly breathe the 4/89 that I inject. The recycler then functions like a regulator: the gas does not really have time to circulate in the loop.

OXYGEN CONTROL

These are electronic rebreathers but deactivated: During the dive, I manually control the partial pressure of Oxygen constantly. I am more "oxygenated" than in the open air, but I chose, unlike many, to dive with a very low oxygen level, even at the stops (pp O2 <1.6). Above all, I fear hyperoxia. On the computer I can read the potential toxicity of the mixture. Depending on this, I inject or not the diluent, or the Oxygen. It's like a stab inflator, very practical: Right Oxy, left Mix.

DECOMPRESSION

The computers work with traditional Bulhman algorithms. Connected to the rebreather, they monitor the gas I breathe in real time. And calculate a theoretical decompression from the depth of -50m where the countdown begins for this kind of cave profile. To reduce decompression times, in addition to personal procedures based on my experience and my physiology, I adopted a Gradient Factor of 80/80 which is quite committed. I am indeed close to the maximum desaturation curve (at 80%). Usually we follow a GF of 50/80… Following the findings of this last dive and to prepare for future attempts, Bernard Gardette also sent me new curves adapted to my physiology.

CONSUMPTION

As can be seen in the various data tables, during this 7 hour dive to -308m, I only consumed 850 litres of Trimix 4/89 diluent and 486 litres of pure oxygen. Or an average of 0.4 l/min of Oxygen, including the numerous rinses. An extremely low metabolism…

PHYSICAL AND MENTAL PREPARATION FOR THIS TYPE OF DIVE

Over the course of our attempts, we gradually abandoned the notion of "mixed redundancy" by transporting "bail-out" bottles in an open circuit. It's useless at these depths because it's too heavy! In an open circuit, for this type of dive, it would have been necessary to carry 25 to 35kg of various gases, the equivalent of 10 bottles of 20 l to 200 b for a weight of more than 200kg… In addition, a classic regulator does not work properly at these depths: The required flow rates are far too high.

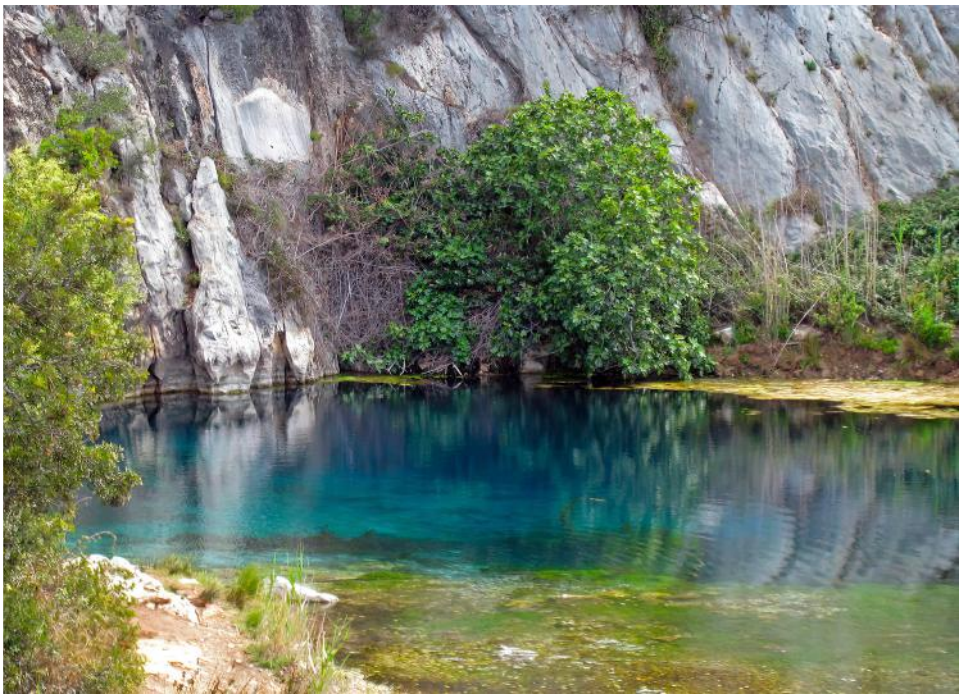
Which means that it is necessary to develop a psychological adaptation to the potential risks of breakdown on the main rebreather. Hence the use of a second redundant recycler. We therefore completely switched from open circuit technique, to closed circuit technique. Which surprises all divers of the older generation, accustomed to "assisted" breathing. Indeed, the regulators, without us being aware of it, are very flexible when inhaling, which triggers an influx of gas at positive pressure. With rebreathers, it's different: It's our lungs that decide, and it takes both physical and psychological training to be able to ventilate effectively. We must control our breathing rhythms, our consumption, our metabolism. And above all, do not allow yourself to be drawn into the effort zone, otherwise you will experience uncontrollable and often fatal shortness of breath. You have to acquire the strength to ventilate yourself for a long time. I have experience diving for more than 15 hours with this type of mixture and equipment.

My goal is to be as light as possible. The most hydrodynamic. To get to the point. To be able to progress underwater quickly and without excessive and unnecessary fatigue. In full possession of my means without superfluous accessories that could influence my psychological state. So I gave up the pressure gauges on my tanks as I am so fine-tuned to knowledge acquired during my training and development dives. I know exactly what I am consuming. A kind of "alpine technique" adapted to deep sump exploration.

THE HISTORY OF EXPLORATIONS AT FONT ESTRAMAR

FROM COUSTEAU TO SWIERCZYNSKI

It was on the initiative of Professor Petit, Director of the Arago Laboratory in Banyuls-



LEFT: The entrance to Font Estramar. **RIGHT:** Estramar.

sur-Mer that on 27 August 1949, two officers of the 11th BPC (Shock Parachute Battalion): Lieutenant Dupas and Lieutenant George, dived into the abyss, equipped with the Cousteau-Gagnan autonomous diving apparatus. They dove through an entrance in the form of a porch about four metres below the surface, at the very foot of the cliff which overlooks the basin. From there, they progress into a vertical shaft approximately 6m high, opening into a large, totally submerged room -14m from where two opposing galleries appear to branch off, one towards the south and the other towards the north. Noting that these galleries continue to sink inexorably into the mountain, the divers prefer not to explore further and decide to go back up for lack of more suitable equipment.

Followed by the expeditions carried out in 1951 by Cousteau, Tazieff and other great divers… several secondary galleries were explored around the main conduit. The depth reached in 1955 was 50m, the techniques of the time not allowing it to go any lower.

In the 1970s, Claude Touloumdjian explored a total of 850m of galleries in several branches of the network. In 1981, Francis Le Guen advanced in the main conduit to the Well of Silence (410m) and explored it down to -58m.

In 1991, the ARFE (Research Association of Font Estramar) was created and the depth of 164m was reached on 15 August 1997 by the Swiss Cyrille Brandt. Pascal Bernabé continued to -184m on 4 June 2006. Jordi Yherla, a Catalan diver, descended to -191m without finding a continuation of the sump, in July 2013.

On 16 August 2013, Xavier Méniscus, equipped with a double rebreather and helped by a large international team, continued the exploration of the cavity in the giant Loukoum well located 513m from the entrance, to a depth of -248m (900m from the start), bringing the development of the cavity to approximately 2,900m.

In July 2015, the same diver, with the help of around 15 team members, pushed back the exploration by around 30m to a depth of -262m.

In June 2019, Xavier Méniscus continued his exploration over a distance of 50m horizontally to a depth of 262m to reach the lip of a vertical well.

After these three explorations, on 30 December 2019, Xavier Méniscus descended to -286m in the bowels of Font Estramar, at a distance of 1,020m from the entrance.

On 3 November 2023, Marseille diver Frédéric Swierczynski reached the depth of -308m, a new world record, during a 6.59 hours dive. Stopping in front of the void after pulling 70m of line.

A CURSED SPRING?

Due to numerous accidents, Font Estramar has a very bad reputation as an "accident-prone" cavity. Already in July 1955, during a television shoot with Haroun Tazieff, diver Jean-Claude Guiter lost his way in an annex of the south gallery and died there. A plaque on the cliff commemorates this death which will mark the spirits. This fatal accident justified a temporary ban on diving. The diver not having been found, the portion of the gallery where his body was supposed to rest was blocked. It was only in 1958 that his body was seen by André Bonneau, stuck in a chimney.

Another Czech diver died in Font Estramar in May 2008. On this occasion, the source gained its sinister reputation as a "killer sinkhole" when this was not the case, in fact. A labyrinthine maze, certainly, and deep but no more dangerous than many lesser known, and therefore less frequented, drowned caves. This resurgence is the only site in the area, so more divers go there. But there are more people dying on the beaches, or in the mountains, than here. The problem is that it's unknown. Exploratory cave diving is a specialised discipline, which requires specific and rigorous training and techniques under the penalty of death.

As Frédéric reminds us: "It is a shame that the Pyrénées-Orientales does not do like other French departments. The Lot, for example, is the number one destination in Europe and attracts divers from all over the world; an incredible economic windfall. The department took the lead: they did everything necessary to welcome the divers. It is time for things to be done the same way in Font Estramar."

But the popularity of this Catalan source only continues to grow, and the black series continues. On 24 May 2012, a specialist of the place, the Gruissanais Jean-Luc Armengaud, lost his life there. We also recorded, on 23 January 2016, the death of a Sète diver in his fifties, then on 10 June 2017, the death of a 44-year-old Finn whose body was found far beyond -200m by Frédéric Swierczynski. Belgian stuntman Marc Sluszny in turn disappeared in a diving accident on 28 June 2018. The following 9th of July, Laurent Rouchette, a cave diver from Spéléo Secours Français, died during the search for the body. Finally, on 19 July 2023, an experienced diver from Puy-de-Dôme, aged 63, lost his life while returning to the surface.

THE TEAM L-R: Ugo Tonolini, Bruno Gaidan, Yvan Dricot, Michel Ruiz, Frédéric Swierczynski, Franck Gentili, Christian Deit. **OUT OF FIELD:** Christophe Imbernon, Patrice Cabanel.

THE TEAM

CHRISTIAN DEIT

55 years old. Dive leader. Caving rescue technical manager. Bell management. A regular here, he is "The Font Estramar's man". He also oversaw Pascal Barnabé's dive to -330m in the sea.

FRÉDÉRIC SWIERCZYNSKI

50 years old, push diver.

BRUNO GAIDAN

65 years old, deep decompression support diver. 4 hours of diving from -130m to -9m.

FRANK GENTILI

54 years old. Deep decompression support from -130m to -50m. 2h 30mins diving.

PATRICE CABANEL

30 years old, assistance diver, up to -190m. Video shots. Assembly and installation of the bell.

UGO TONOLINI

30 years old. Bell assembly. Decompression support at - 6m.

THE "CATALAN TEAM", LOCAL DIVERS

YVAN DRICOT

60 years old. Logistics and good humour.

MICHAEL RUIZ

60 years old. Support diver. Fitting the decompression bell. Logistics.

CHRISTOPHE IMBERNON

30 years old, support diver. Preparatory dives. Logistics. Shooting.

FROM +5870M TO -308M:

FRED, THE AMPHIBIOUS EXPLORER

Speleonaut explorer. I Live in Marseille, France. I am 50 years old. Mechanical engineer. Trimix, Cave and Rebreather Instructor. Diver since the age of 12. First solo Trimix dive at -120m at the age of 18. Began using the rebreather in 2000.

OCTOBER 1994

Font Del Truffe (Lot, France). Longest "multi-sump" dive: 21 hours.

NOVEMBER 1999

Saint Sauveur (Lot, France). Main gallery explored up to - 98m.

MAY 2016

Port Miou (Calanques of Marseille). New deep gallery was discovered in the "terminal" well, 1600m from the entrance. +140m.

AUGUST 2016

Mescla Cave (Gorges du Var, Alpes Maritimes). Exploration of sump no. 3 down to -267m.

MAY 2017

Crveno Jezero (Red Lake, Croatia). 3rd widest karst chasm in the world, explored to the bottom at -240m during a 180 minute dive.

MAY 2019

Ojos del Salado Lake (Argentina). World record for altitude diving at 5870m.

AUGUST 2019

Miljacka, Cetina Glavas & Gospodska (Balkans). Underground post siphon camp. More than a kilometre of firsts.

SEPTEMBER 2019

Harasib (Namibia). Deep dives (>100m) and scientific work to the bottom of a karst chasm of more than 120m.

NOVEMBER 2023

World depth record at Font Estramar in France: -308m.

SPELEOMETRY

The 15 deepest cave dives in the world (human explorations).

Font d'Estramar	France	-308m	Frédéric Swierczynski
Boesmansgat	South Africa	-283m	Nuño Gomez
Zacatón	Mexico	-282m	Jim Bowden
Tianchuang	China	-277m	**Han Ting** †
Hranická propast	Czech Republic	-265m	Krzysztof Starnawski
Nacimiento del Rio Mante	Mexico	-264m	**Sheck Exley** †
Fontaine de Vaucluse	France	-250m	Pascal Barnabé
Viroit cave	Albania	-278m	Krzysztof Starnawski
Lago Azul	Brazil	-274m	Gilberto Menezes de Oliveira
Grotte de la Mescla	France	-267m	Frédéric Swierczynski
Vrelo cave	Macedonia	-246m	Luigi Casati
Crveno jezero	Croatia	-240m	Frédéric Swierczynski
Goul de la Tannerie	France	-240m	Xavier Meniscus
Sra Keow cave	Thailand	-240m	Ben Reymenants & Cedric Verdier
Port Miou	France	-233m	Xavier Meniscus

†: deceased during attempt

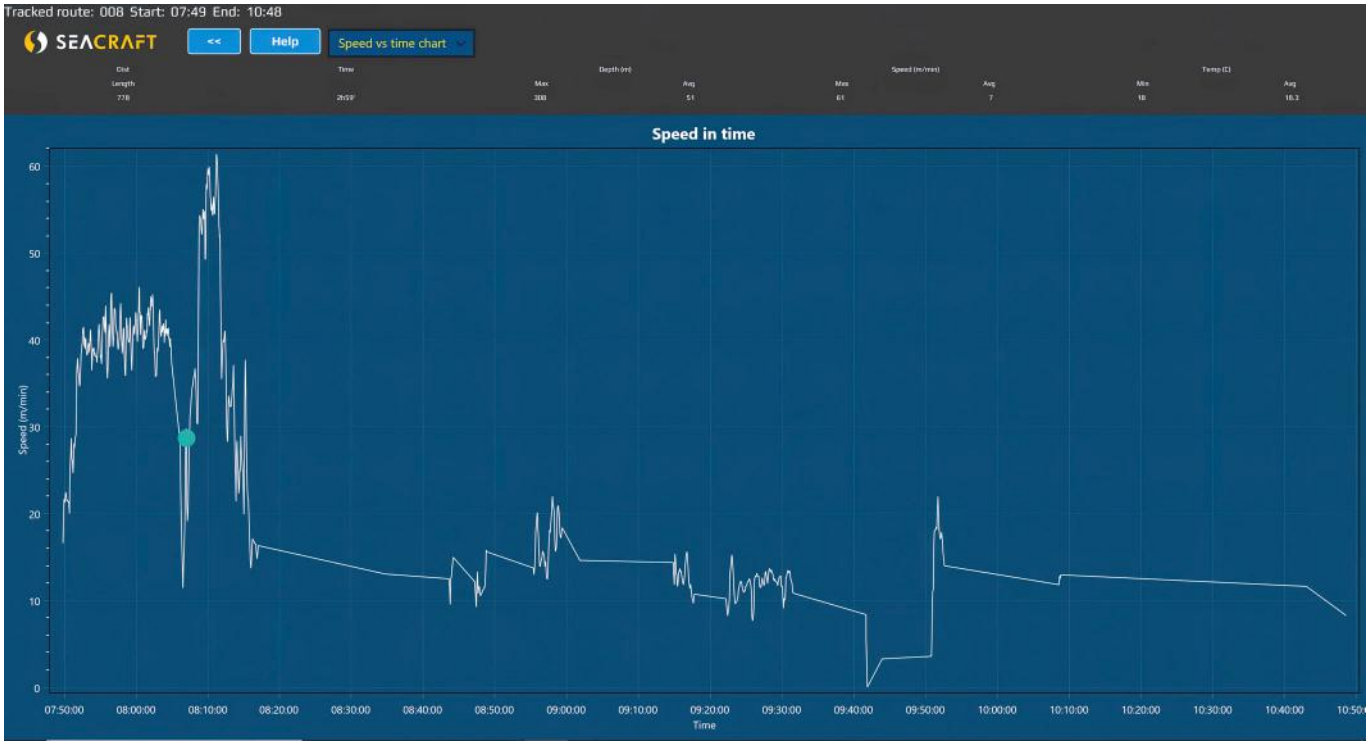
THE HYDROGEOLOGY OF FONT ESTRAMAR

Font Estramar (or Rigole's Spring) takes its name from "Font Extrema", in reference to its location at the extreme limit of the territory of the commune of Salses-le-Château (Oriental Pyrenees). It springs out at the foot of a small cliff, at the edge of the highway. An escarpment of tectonic origin, on the edge of a plateau nearly 200m high, in massive limestones of Urgonian (Barremo-Aptian) facies.

It drains jointly with Font Dame the karst system of Corbières d'Opoul and the Bas-Agly syncline and receives the losses from the Agly and Verdouble rivers. It constitutes the main supply of fresh water to the Salses-Leucate pond. The karst system is also connected with the Plio-Quaternary aquifer, an important water resource for the Perpignan region. The flow of the resurgence is used downstream of the basin by a fish farm before reaching the sea.

Font-Dame is a sub-lacustrine source, formed by eight emissive cracks hidden by a floating phragmites marsh (exploited reed bed). Both are important Vauclusian springs with a low flow rate of 1.5m3/s for Font Estramar and 2m3/s for Font-Dame. Other springs mark the same tectonic contact: the temporary exsurgence of the Malpas, and emergences through the alluvium, in the Salses plain. The whole represents the outlets of the karst hydrosystem of the south-eastern Corbières.

The water is slightly brackish, probably due to the intrusion of deep salty wedges coming from the Leucate pond and the sea. In the Upper Miocene, during the "Messinian crisis", from more than 5 million years ago, the evaporation and regression of the Mediterranean Sea to a depth of more than 1000m, led to strong karstification below the current sea level (at -300/-400m). Constant temperature throughout the year: 17.8°C.



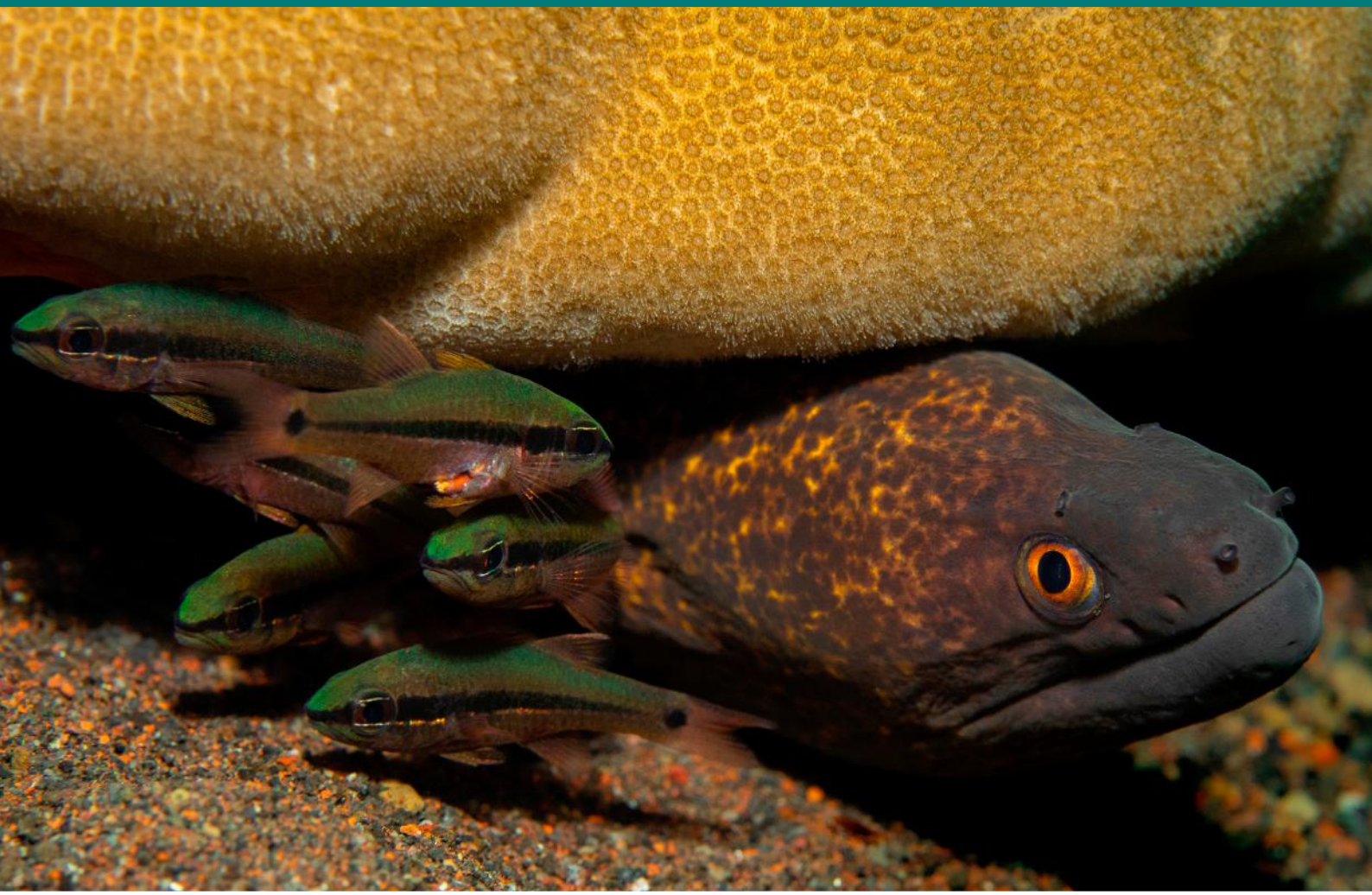
TULAMBEN

A WRECK & MACRO HAVEN

FEATURE AND PHOTOGRAPHY **ALDO GUSTAVO GALANTE**

This area has achieved such relevance in terms of species that today it competes on equal terms with places such as the Lembeh Strait, Komodo, Alor and Ambon in Indonesia; and Anilao, Puerto Galera, Romblon and Dauin in the Philippines – all premium places in terms of biodiversity.

Pomacentrus auriventris



L-R: *Gymnothorax flavimarginatus; Costasiella sp.* (4mm); *Costasiella usagi; Favorinus tsuruganus;* and *Doto ussi Ortea.*

The Island of Bali, Indonesia has so many different dive sites offering all dive levels and diver preference – and with the best price-quality that I have ever experienced.

From large molas, manta rays, sharks, occasional whale sharks, drift dives, and even Blackwater diving, they have it all.

But Bali also has some excellent places for macro photography. In Tulamben's "Macro" area, you can find countless strange and exotic species such as rhinopias, and the tiny pygmy seahorses of just a few millimetres in size. It is precisely why this area is called Tulamben Macro and what my article is about this issue.

The small village of Tulamben is located in the northeast of Bali Island in the Kubu region, in the Karangasem province, about a 2 to 3 hours drive from I Gusti Ngurah Rai International Airport.

Before it became a well-known tourist spot for both diving and snorkelling, Tulamben was originally just a humble fishing village. The name Tulamben comes from the word Batulambih, which means "many stones", due to the number of stones on the beach as a consequence of the destructive eruptions of the nearby Gunung Agung Volcano, 3,142m high above sea level. The eruption of Gunung Agung Volcano in 1963 devastated much of the eastern side of Bali, and left more than 2,000 dead in the area.

There are no gorgeous beaches or wonderful temples here. But underwater, there are stunning coral reefs and lots of marine life. You only go to Tulamben to dive – it is almost a law.

To find black or golden sandy beaches, magical sunsets, and to have a few drinks with great gastronomic variety, there is Amed, located about 20-30 minutes by car or motorcycle from Tulamben. But, this place will be for another chapter since Bali is a country apart from Indonesia, in many ways.

USAT LIBERTY WRECK

Tulamben has one of the world's most famous wrecks, and it is because of this sunken ship that the place became so well known by divers from all over.

"The Liberty" (as it is most commonly known), is 120m in length. The difference with many other wrecks is that this one looks like a reef covered with a large amount of hard and soft corals, swarming with marine life. It is considered one of the best dives in Bali, Indonesia, and, the world.

A LITTLE HISTORY

The ship was launched on the 19th of June 1918 by the Federal Shipbuilding Company and acquired by the United States Navy on the 7th of

L-R: Leaf Scorpionfish (*Taenianotus triacanthus*); *Pseudobalistes flavimarginatus; Goniobranchus verrieri;* Redbreasted Wrasse (*Cheilinus fasciatus*); and *Antennarius maculatus*.

October 1918, assigned to the Overseas Naval Transport Service during World Wars I and II.

In January 1942, in the midst of the Second World War, en route from Australia to the Philippines with a shipment of railway parts and rubber, it was torpedoed by the Japanese submarine I-166 about 10 nautical miles southwest of the Lombok Strait. The ship was not sunk, but it was seriously damaged. An attempt to tow it to the port of Singaraja on the north coast of Bali was made which then belonged to the Netherlands. The amount of water entering through the damaged hull made it impossible to tow any further, and it remained on the coast of Tulamben to try to save the cargo.

The ship was stranded on the surface of the beach for more than 20 years, until the eruption of the sacred Mount Agung occurred in 1963. Due to strong earthquakes, the ship slid into the depths of the Ocean, giving rise to the birth of the mythical, "Liberty Wreck". Thanks to the rich waters of the Indo-Pacific, it is completely covered with hard and soft corals, huge sponges, anemones, gorgonians, fish and so much more.

The Liberty allows us to dive with more than 400 species of fish and 100 species of pelagic, according to some calculations. It is an ideal wreck for Open Water divers, but also for the most experienced. Amongst the jewels that can be found in this wreck, there are large schools pf parrotfish, sweetlips, nudibranchs everywhere, eagle rays patrolling the bottom, dozens of toadfish of all types and sizes, clown triggerfish, lionfish, pygmy seahorses, groupers, sometimes sharks, schools of barracudas, and numerous anemones that have colonised the wreck with the different species of clownfish. There is just an overwhelming amount of life. It is the wreck with the most life attached to the hull that I have dived so far. I include the famous SS Thistlegorm of 127m in length, and the largest unintentionally sunken ship, the SS President Coolidge of 200m in length, which I have already dedicated an article. Both wrecks are nothing like the Liberty which looks more like a reef than a boat.

The beach where the wreck is located, is very atypical. It is made up of large round stones, which make it impossible to lie down and sunbathe. It is covered with vegetation, and it is these large stones also found underwater that cause the water to continuously filter particles and ensure that the area has good visibility – between 15 and 30 metres.

You enter the wreck's vicinity by walking in from the rocky beach which has great advantages such as avoiding travel time and reducing costs since there is no need for a boat. You just pay for your tank and a local

OPPOSITE PAGE: *Neoglyphidodon melas* and *Lysmata amboinensis*. **ABOVE:** Pufferfish (*Arothron*).

guide. A dive is usually between USD15 and USD25, depending on the company.

The wreck is a little tilted, as you can see from the image. The top lies between 5m and 9m deep, and the rest drops to about 29m to 35m depending on the tides, meaning that divers of all levels can experience parts of this wreck. The position in which the boat is located also gives snorkellers the possibility to see it due to the great visibility usually there.

TULAMBEN MACRO

Having spoken with the local guides, no one knows for sure when macro diving first began here. It became a reality not that long ago, and this is the central theme of my article, since not many know Tulamben for this discipline of diving; they only go there to dive the wreck. This is what happened to me the first time I visited this place back in 2005.

In the surroundings of Tulamben, there are many dive sites that can be accessed from the black sandy and rocky beaches in search of the large number of exotic species sized from just a few millimetres, to medium-sized ones. It's a photographers' paradise. Nowadays, many people come to dive the sandy bottoms and skip diving the Liberty Wreck altogether.

This area has achieved such relevance in terms of species that today it competes on equal terms with places such as the Lembeh Strait, Komodo, Alor and Ambon in Indonesia; and Anilao, Puerto Galera, Romblon and Dauin in the Philippines – all premium places in terms of biodiversity.

In Tulamben, most dive centres have no boats. They use small vans to drive divers and the equipment to the beaches where local families (paid by the companies) wait to carry the tanks and equipment to the kit up area for the divers to get ready before entering the water. These locations also have fresh water for photographers to rinse their cameras between dives, showers, and some pretty decent toilets also. In addition, the families have rustic kiosks set up where they serve tea, Balinese coffee, and something to eat during the surface intervals, which makes the wait very enjoyable.

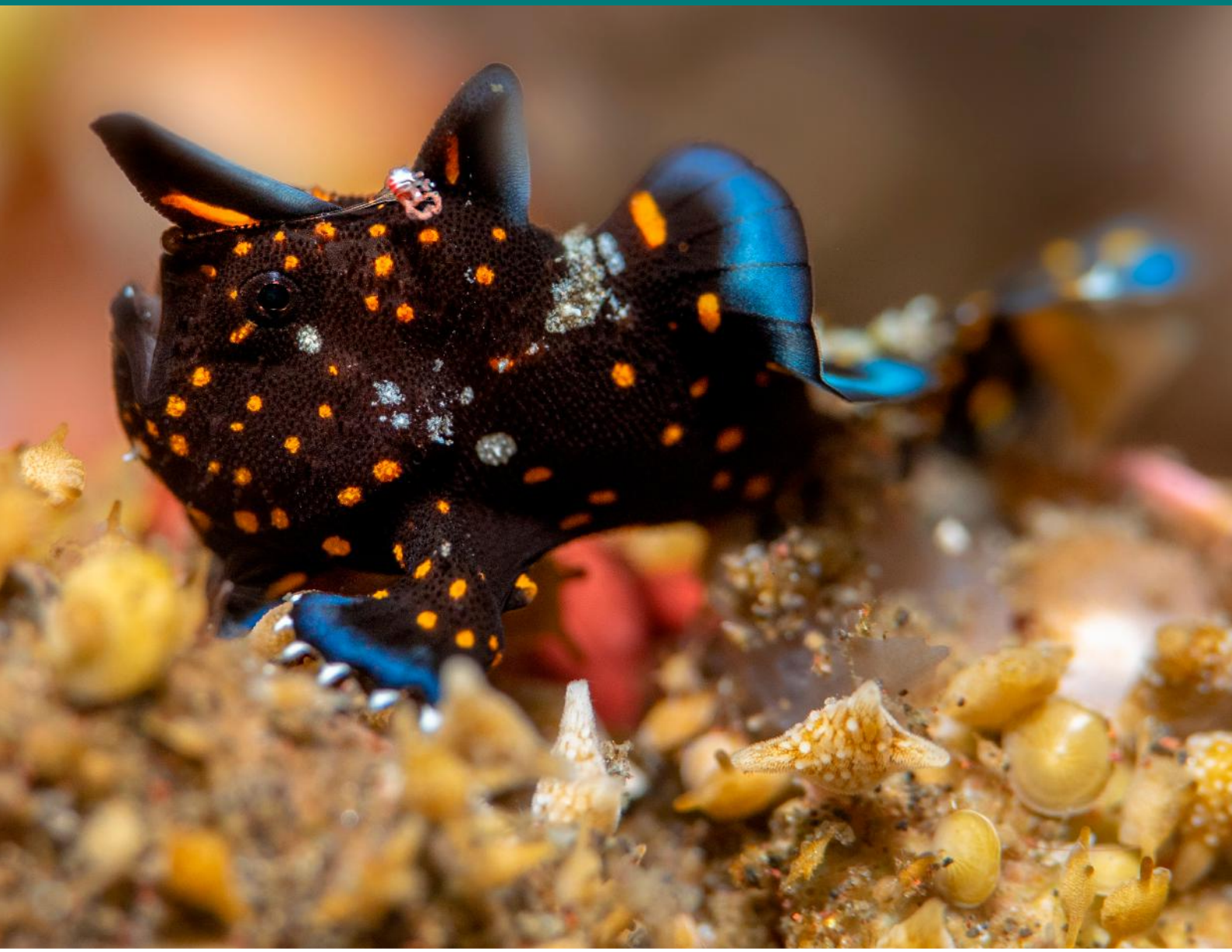
Once in the water, amongst the stones and black sandy bottom, you'll see species such as toadfish, ghost pipefish, rhinopias, seahorses of different species and, as if this were not enough, Tulamben is considered one of the "nudibranch capitals of the world". The diversity and quantity of these colourful and beautiful creatures we see on each dive is truly striking.

Dive sites such as Sidem, Batu Belah, Bulakan, Batu Niti, Melasti, Blue Hill, Seraya Secrets, Batu Ringgit, Gerombong, and Bali Dive Resort House Reef are all located here. There are also plenty of beautiful sites to see large fauna and healthy reefs with turtles and angelfish. Dropp Off, Coral Garden, Liberty Coral Garden, and Kubu are all close to Tulamben. There is also another wreck to see, the Kubu Wreck.

The best time to visit Tulamben is from April to December, and then the rainy season begins. To be able to dive the area well, a minimum of a week to 10 days is required.

Although there are many diving resorts in the region, I personally recommend the Bali Dive Resort and Spa, managed by Miikka and Nicole, who are always willing to offer the best service and diving experience. I've stayed there on each of my visits to Tulamben. In addition to the beautiful and comfortable rooms, it has a unique garden, with views of the G Agung Volcano in the background, and the beach in front has the most perfect sunrises. It's a haven of peace and unmatched harmony with nature. Plus the excellent Spa service that my wife enjoys every time we go, the breakfast that is included in the daily rate, the variety available, and the impeccable service.

The Resort has a great diving operator, with good equipment. Something to highlight which



L-R: Juvenile Warty Frogfish (*Antennarius maculatus*); Micro Corals; Cuttlefish; and Hairy Shrimp (*Phycocaris sp.*).

is not common, is the price of each dive costs the same for air or nitrox. This is a big plus point since most companies around the world charge extra to dive with nitrox!

Bali Dive Resort and Spa has excellent value for money, without a doubt. On the dives I am always accompanied by an excellent Dive Guide with eagle eyes, called Tut Beng, alias Dharma. He is the one who is in charge of searching and showing me the smallest and rarest species that the area has to offer. It should be noted that in these types of dives the Dive Guide is extremely important, and this operator offers excellent searchers for the small fauna (macro and supermacro). This same resort has another one located in the town of Amed.

Located more in the centre of the town of Tulamben, is the Matahari Tulamben Resort, Dive & Spa which is also a very good diving resort. They also have expert guides and good cuisine. This resort also contributes to some great info by the owners, who are great hosts and underwater photographers.

There are also several other diving companies of different prices and categories, many of them with spectacular dive guides that would be impossible to name, but personally I would highly recommend these two accommodations that I have mentioned.

L-R: Banded Snake Eel (*Myrichthys colubrinus*); *Paracirrhites forsteri*; *Odontonia katoi*; and *Phyllodesmium iriomotense*.

There is an exclusive Facebook group called "Tulamben Macro", whose administrators are two great international class photographers, such as Ajiex Dharma, and Lilian Koh, for anyone interested to join.

From my humble opinion and experience in the area, I would advise you not to dive Tulamben on day trips from the south of Bali, where the capital and the Airport are located. The trip is long and you will not get to enjoy the region or the infinite variety of dive sites that the area has to offer. Furthermore, the "real Bali" is located in the interior of the island, in remote places far from the bustle of its capital and touristic areas.

I hope you get the opportunity to enjoy Bali's beautiful culture and its exquisite dive sites such as those in Tulamben. I consider it a wonderful and unmissable place for all divers. Until the next dive…

RESORT RECOMMENDATIONS

Bali Dive Resort and Spa
www.balidiveresortandspa.com

Matahari Tulamben Resort, Dive & Spa
www.divetulamben.com

FACEBOOK GROUP

Tulamben Macro
www.facebook.com/groups/1916665745231403

BACK TO BALI

FEATURE AND PHOTOGRAPHY **GORDON T. SMITH**

It seems everyone made the same decision to go back to Bali this year, at least quite a lot of divers I know in the UAE made that choice over the summer months.

Ornate Ghost Pipefish, *Solnostomus paradoxus*.

Yellow Paddle-Flap Scorpionfish, *Rhinopias eschmeyeri.*

It seems everyone made the same decision to go back to Bali this year, at least quite a lot of divers I know in the UAE made that choice over the summer months.

And me? Well I waited until mid-September before heading there taking advantage of some credit from Emirates Airlines from a cancelled flight to the UK during COVID restrictions in 2021.

I got 11 days of diving in, and 30 dives with two buddies who travelled to join me from the USA and Australia. I could have done more, but as I age I have become wiser to realise when enough is enough, it's quality over quantity. After three dives a day of shore diving and precariously balancing on wobbly boulders getting in and out, I'm ready to relax with a cold beverage and download my photos to my computer.

Diving the Tulamben coastline in Bali is predominantly shore diving, and there are some famous dive sites where some special creatures live. This was my sixth dive trip to this location, and my fifth stay at Villa Alba, which did not disappoint.

Most of the dive sites I visited, I had dived before with one exception, the Kubu Wreck. After my dive there, I really regretted not bringing my wide-angle lens and dome port!

I also regretted not bringing my 5mm wetsuit as not only did we hit 25°C on a couple of dives, the multi dive days seemed to suck the heat from my body when diving three dives per day. I took a break one morning and travelled to Denpasar with the driver who was picking up another one of my buddies joining us for the second week. It gave me the chance to pop into the Bali Dive Shop and get a 2mm vest, and that thankfully helped for the next five days. Most days, the average water temperature was 26-27°C and I only had a 3mm wetsuit with me. In 2022 during both my visits in May and October, the water temperatures were 29-30°C.

On this trip, I dived 10 of the many dive sites at Tulamben:

- Sidem x 5
- Seraya Secrets x 2
- Villa Alba House Reef x 5
- Melasti x 2
- Pura Gerombong x 4
- Batu Niti x 3
- Batu Ringit x 4
- Kwanji x 2
- Bulakan x 2
- Kubu Wreck x 1

On days one and two, I was very lucky to

Orange Paddle-Flap Scorpionfish, *Rhinopias eschmeyeri.*

photograph a *Rhinopias eschmeyeri* at Sidem, and on my second last dive day at this site, we found another one with a different colour. This site is really special and the entry/exit is fairly easy, unlike Kubu Wreck and Bulakan, and to some degree Villa Alba House Reef and the Liberty Wreck. I skipped the latter this year, as it's one of these sites that everyone wants to dive and can get very busy with DSDs and other rather inexperienced divers. Liberty Slope to the right of the wreck though usually has good macro.

The main attraction at the Liberty Wreck for me was always the large Bumphead Parrotfish – who sadly no longer exist there as they are rumoured to have been eaten during COVID!

Speaking of inexperienced divers, we noticed a lot of them on this trip! I have always stated, "until you can dive properly, do not take a camera with you." I observed some of the most appalling behaviour on this trip of divers kicking up mini black sandstorms even when laying along the bottom, their fins unable to stop moving for some inexplicable reason and ruining visibility behind and below them for several metres.

On one occasion whilst photographing an ornate ghost pipefish, a diver plonked himself next to me and put his legs on top of the crinoid with my subject. Two sharp jabs from my muck stick, I forcibly pushed him off and away with my loud underwater cursing to which he moved far from me, much to the amusement of my buddy and our guide.

I think it's about time for one of the dive agencies to come up with an "Underwater Etiquette" course.

At Villa Alba House Reef, we were lucky to have a yellow pygmy seahorse, but at 31m the NDL was limited. It was also a seahorse that was not agreeable to being photographed no matter how much gentle coaxing by the guide, and I had to make several visits in order to capture an image that I was happy with.

An interesting experience lay above us on these dives as several large (one metre) cuttlefish had chosen an area of coral to lay their eggs. They were obviously not bothered by divers as they came very close to us, and this prompted my buddy Jennifer to do her last dive there with her wide-angle lens.

Naturally, I was there for the small stuff, primarily nudibranchs and other small critters and was using my 60mm and 105mm lenses with +5 and +10 diopters on a random basis except for the pygmy

TOP: Painted Frogfish, *Antennarius pictus*, photo by Jennifer H. Cheung. **BOTTOM ROW:** Cuttlefish, *Sepia sp.*, hiding in a Crinoid; Harlequin Shrimp, *Hymenocera picta*; and Nudibranch, *Melibe sp.*

seahorse, which necessitated the 105mm lens and the +10 diopter.

For the majority of dives, Big Wayan was my guide, I have used him on two previous trips, and he's a great spotter as well as a helping hand getting in and out of the water, especially in rough conditions which was the case on the first few days of my trip. Visibility in the shallows was almost zero, I couldn't see my feet when putting my fins on.

These conditions also required washing the main camera O-ring, and strobe O-rings every day when changing batteries and downloading photos. The black volcanic sand seemed to get everywhere. I also made a point of rinsing my regulator and my wing inflator mechanism extremely well after every dive day to avoid any gear issues.

Critterwise on this trip, seeing two different *Rhinopias eschmeyeri* was such a bonus as I'd only ever seen two before (one here in Tulamben last year, and another in Anilao, Philippines). Most dive sites also had Harlequin Shrimp, *Hymenocera elegans*, whose diet apparently consists of starfish legs, and we spotted at least one on a daily basis, some of which were rather small.

Of the nudibranchs, there were many *Mexichromis* species (*multituberculata, mariei* and *trilineata*). Most however tended to be very small aeolids which are challenging to photograph, especially in current with a 105mm lens and +10 diopter.

Ornate ghost pipefish (*Solenostomus paradoxus*) appeared to be present at every dive site with some nice variation in colours. Various frogfish were also spotted daily, especially juvenile ones that change dramatically as they get older, from cute to downright ugly.

On one occasion whilst photographing a frogfish that was walking along the sand, I got down low to get some head-on shots, but it started to jump into the water column attempting to swim. As I finned backwards trying to keep it in focus, it just disappeared! As it was a nice pretty orange frogfish (by frogfish standards), I wanted more shots but couldn't find it. Big Wayan pointed to my camera housing, and there nestled inbetween the control knobs was the frogfish – no doubt






TOP L-R: Juvenile Warty Frogfish, *Antennarius maculatus;* Ghost Goby, *Pleurosicya mossambica*, on a SeaPen; Thorny Seahorse, *Hippocampus histrix*. **BOTTOM L-R:** Sea Slug, *Thuridilla gracilis*; Nudibranch, pair of *Hypselodoris tryoni*, note colour difference; and Sea Slug, *Elysia sp.* **RIGHT:** Yellow Pygmy Seahorse, *Hippocampus bargibanti.*

trying to figure out if it should now change its colour from orange to black. I signalled to my buddy Jen, pointing to my camera. She burst out laughing and got a great shot of it.

Villa Alba has fully recovered post-COVID, and all of the staff are now employed full-time again. Jessica, who owns and runs the resort and dive centre, checked out a couple of new sites while we were there. The feedback was fairly positive, but they were more like "Drop-Offs" – not for muck diving, with some large fans etc, suitable for wide-angle photography. Next year I will hopefully find out for myself.

Emirates are running two flights daily to Denpasar from Dubai, one of which is on an A380. Although visas are available on arrival, it's best to do this online and avoid at least one queue. Additionally, the customs form should be done online too, no more than 72 hours prior to arrival in Bali.

The journey from the airport (DPS) to Tulamben is approximately three to four hours by road, depending on your arrival time and the traffic in Denpasar. For some arrival times it might be better to stay at a hotel near the airport and find transport to Tulamben the following morning.

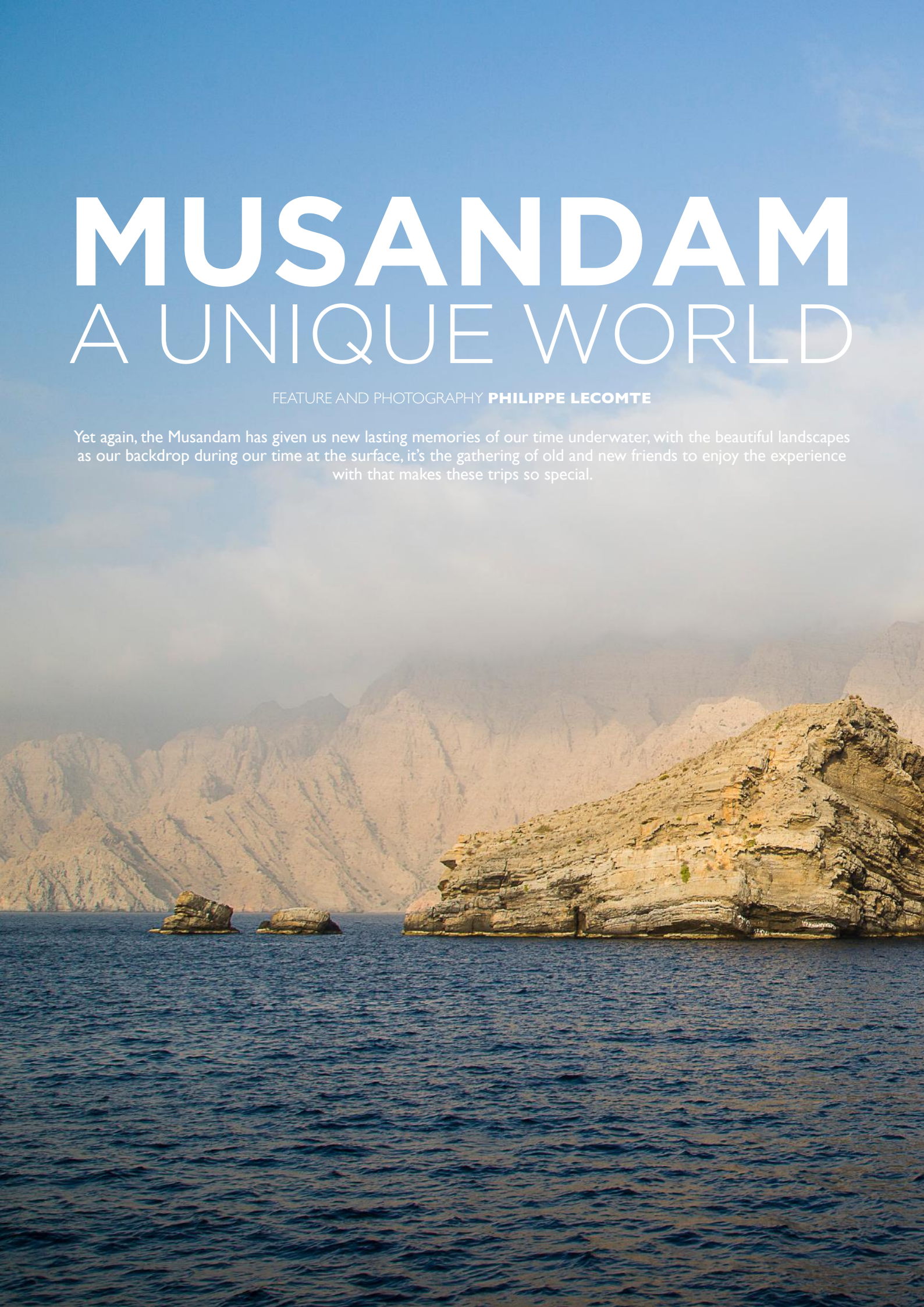
My EK flight on the A380 arrived at 16:00 hrs and I arrived at Villa Alba at 22:00 hrs. Fortunately the staff were aware of my arrival and the kitchen staff prepared a quick meal for me when I arrived.

www.facebook.com/VillaAlbaDiveResort

MUSANDAM
A UNIQUE WORLD

FEATURE AND PHOTOGRAPHY **PHILIPPE LECOMTE**

Yet again, the Musandam has given us new lasting memories of our time underwater, with the beautiful landscapes as our backdrop during our time at the surface, it's the gathering of old and new friends to enjoy the experience with that makes these trips so special.



I had been longing to dive back in the Musandam for such a long time. Since the pandemic, the border closures and the travel bans, the Musandam seemed ancient history.

Kathleen Russell from Al Mahara Diving Centre in Abu Dhabi recently organised a dive trip to the Musandam with a friend in common who was visiting the UAE at the time. Having not seen Peter for a long time, I told myself that it would be a good opportunity to dive together and more so, in the Musandam.

After an exchange of messages via WhatsApp, the weekend of the 10-11th of October was booked. The rendezvous at the Omani border was scheduled at 21:30. A member of the boat crew met our group to hand over all the necessary paperwork in order to cross the border. After that, we headed straight to Dibba Port, Oman to board our livaboard dhow which would be our home for the next 2 days with 4 dives scheduled (3 day and one night) on the Saturday, and 2 dives on the Sunday.

Mattresses and pillows are provided for the nights' sleep under a starlit sky. Depending on the season, it is best to bring a sleeping bag and blanket – especially for winter nights which can get very cold. The dhow headed North once everyone was on-board for a 3-4 hour cruise before dropping the anchor in a quiet location for a relaxing night's sleep.

For our first dive the next morning, the boat headed to Umm Al Fayyarin. This is one of the most popular dive sites, and the most beautiful. This site is actually a small island about 4km on the east of Musandam. The prettiest side to dive here is its east side. The dive can get some very strong currents which can also bring some big pelagic fish to the area, such as trevally, barracudas, sharks and *Mola mola*. Dozens of blue triggerfish swim in all directions here.

For our second dive, the group was unanimous about diving this site again. Being one of the furthest sites to get to and offering such unique underwater life, the opportunity to dive it again was too good not to.

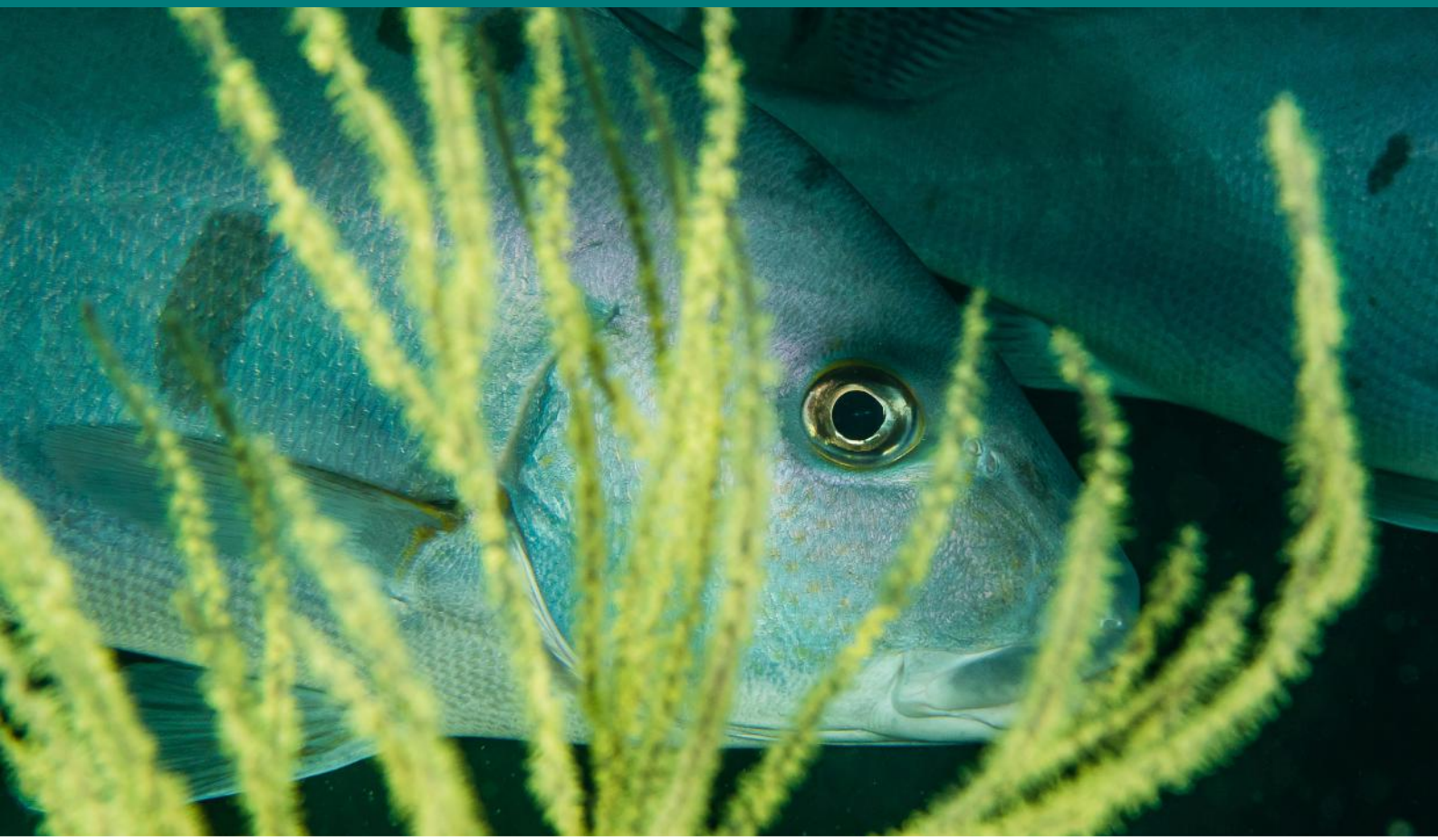
The east of the island consists of hard corals and large rocks covered with orange, red and yellow sponges. There's a great pelagic viewing spot near the southern tip down at 30-35 metres – if the current allows it. Marine life is present everywhere and whether at 35 or 15 metres, this site will always give you some fantastic moments. The rocks and other scree descends to + or - 40m and then follows up to a sandy bottom. The end of the dive, is often rewarded with a grazing turtle at 5-6m busily eating algae from the rocks.

In anticipation for the third dive, the boat headed South towards Ras Sarkan. There, sheltered in a bay, we finally get to sit down to our well deserved breakfast.

Ras Sarkan is a rocky area which is also interesting because it is one of the most eastern dive sites. This means that the chances of meeting pelagic fish are more frequent. But again, you will have to contend with the current. Musandam is a unique place with regard to underwater fauna, but it is also a place where diving conditions can be very dangerous. Accompanied by my dive buddy Peter, we decided to head towards the tip as the current was low. After 15 minutes into the dive, we had to turn back because the current had decided a change of plan. Accompanied by 2 batfish, we finished our dive in the opposite direction.

To end the day's navigation, the boat resumed its southerly direction to anchor close to Lima, sheltering us in a nearby bay. That afternoon, we did a little fishing with the crew to have a fish BBQ that evening, and after contemplating the sunset, we got our equipment ready for the night dive.

For our fourth dive at Ras Lima, we stuck close to the rock so as not to be subjected to the current. The site has a small slope made up of loose rock which descends gently onto a sandy bottom at 20 metres. I have always appreciated night dives in the Musandam. The underwater life is so different. Slipper lobsters,



octopus and other shrimps are much easier to observe at night. The daytime species such as parrotfish, damselfish and surgeonfish are spotted sleeping everywhere under the crevices of rocks, and are completely unfazed by our lights. Always present on night dives, the lionfish follow you closely in order to perhaps swallow one or two cardinal fish frightened by the light beams.

Back aboard the dhow and after a good shower, the call to dinner prepared by the crew was very much appreciated. Around the table, we shared our experiences of the day and ended with a game of cards under the starry night sky.

After a silent night and a good night's sleep, the team was slowly awakened to the calm of Lima bay. At this time of year, the weather is still hot and humid with clouds hung on the Musandam cliffs of the early morning.

For our fifth dive, Octopus Rock is on our itinerary as an essential. This site is very popular with divers. It consists of a large rock emerging at the surface resembling an octopus' head, and underwater, the rock's scraggly formation resembles tentacles. It often happens to cross paths with whale sharks swimming around the rock. The site is also known for its seahorses often hung in white gorgonians at around 25 metres. The end of the dive often ends at 5 metres encircling the rock head. Trevally, snappers and surgeonfish swimming in all directions do not give you time to get bored during your safety stop. And then it's back to the boat, where our breakfast awaits us.

For the last dive of the trip, it is quite common to finish on Ras Lima. This dive is generally done on the north side. The backdrop is made up of loose stones on a sandy bottom at about 25 metres. There are beautiful little caves along the scree which deserve a little exploration, so don't forget your torches. Cardinalfish hide in the caves, and morays and groupers can all be easily spotted. The safety stop is done in soft coral gardens of all colours covering the rocks where the parrotfish, damselfish and angelfish twirl in all directions.

For the final haul back onto the boat, it's time to rinse all the equipment with fresh water so they can dry during the return voyage back to Dibba Port in about 2-3 hours. During the cruise back, the lunch is prepared by the crew and always appreciated by our big appetites built up after the dives.

Yet again, the Musandam has given us new lasting memories of our time underwater, with the beautiful landscapes as our backdrop during our time at the surface, it's the gathering of old and new friends to enjoy the experience with that makes these trips so special.

LET'S TALK ABOUT... GAS PLANNING

FEATURE **TIM BLÖMEKE**

Gas planning is an aspect of diving that many of us are confused about. Depending on your training agency and how long ago it was that you took your Open Water class, you might hazily remember an example calculation that involves a reserve, a safety stop reserve, keeping one third of the remaining cylinder pressure in reserve, and turning the dive at the implausibly precise number of 157 bars. If that sounds impractical to you, then you're not alone. Once you book a trip, you're going to have a hard time finding someone who actually dives that way.

Instead, conventional wisdom holds that the proper gas reserve is 50 bar, a limit common enough to have inspired the naming of numerous scuba-themed drinking establishments around the world. In such drinking establishments, you might hear the occasional tall tale of people finding themselves low on air at 35 metres and saving the day, as if surfacing with a near-empty cylinder was something to be proud of.

Given the discrepancy between what's written in the books and what is talked about over beers, confusion is only natural. In this article, we'll try to untangle things a little. We'll introduce a general principle that can be applied to a variety of diving scenarios. It is based on a concept called RMV (respiratory minute volume), SAC rate (surface air consumption), or SCR (surface consumption rate). With slight variations depending on who you talk to, the three mean roughly the same. If you're not familiar with this concept or could use a refresher, please see How To Calculate Your RMV.

Disclaimer: This article isn't meant to be the be-all and end-all of gas planning. The examples below are provided only to illustrate concepts and don't necessarily apply directly to dives that you do. When diving a new site, be sure to obtain the advice of people who are familiar with it, and when in doubt, always err on the side of conservatism.

THE MAIN IDEA

When a diver experiences a low-on-gas or out-of-gas (OOG) emergency at depth, the protocol is to turn to a teammate, share gas, and end the dive. For this to be a viable solution, the teammate needs to have enough gas for two. Since equipment failures can happen to anyone at any time, the basic principle of gas planning is: At any point during a dive, every diver must have enough gas to cover a bailout strategy for themselves and a buddy who has an OOG emergency.

Sounds reasonable? If we're agreed, then the next question would be, how do we determine this amount? For illustration, we'll look at two examples. Each time, the basic method is to:

- Think through the dive in the form of a narrative
- Identify the worst-case scenario (the worst point in the dive for an OOG emergency to occur)
- Develop a bailout strategy for this scenario
- Break the bailout strategy down into steps and allocate a gas budget to each step
- Add these amounts up to arrive at a total

This total is known as Rock Bottom, Minimum Gas, or Turn Pressure, again depending on who you talk to. They all mean the same: the tank pressure at which you need to start your ascent, at the very latest.

EXAMPLE 1

Let's say we're doing a dive to 30 metres

from a boat, square profile with descent and ascent in blue water or along a line, no deco obligations. The worst-case scenario is an OOG emergency at 30 metres. A possible bailout strategy could be very simple: Establish gas sharing, ascend to 5 metres at the planned rate, do a safety stop, end the dive.

Assuming an RMV of 15L/min, the amount of gas needed would be:

Step	Calculation	Amount
Share gas	1 min @ 4 ata (30 m depth) x 15 l/min x 2 divers	120 L
Ascend to safety stop at 9 m/min	3 min (going from 30 m to 5 m at 9 m/min) @ 2.8 ata (18 m average depth during ascent) x 15 l/min x 2 divers	252 L
Safety stop and ascend to surface	3 + 1 min @ 1.5 ata x 15 l/min x 2 divers	180 L
Total		**552 L**

Our total is 552L, or about 50 bar in a standard AL80 cylinder (11.3 litres). That's an estimate of how much we're actually going to breathe, as an absolute minimum.

So do we turn the dive at 50 bar, the magic number handed down through the ages? Not so fast. There are additional considerations, such as:

- We don't want to surface with 0 bar, ever.
- If 15L/min is our usual RMV, chances are it will be higher under stress. For reference, the maximum RMV a human has been shown to be capable of is between 120 and 170L/min, depending on the human.
- Can we rely on ascending at the planned rate? If we plan for 9m/min but ascend at 6m/min instead in reality, then the second step in our calculation will cost 50% more gas than estimated.

Depending on how we answer these questions, adding a safety margin of somewhere between 50 and 100 percent doesn't seem too conservative, does it? We might therefore decide that our reserve is 80 bar. Or 100. Once any diver on the team reaches this pressure, we need to end the dive. If we stay longer, then our bailout strategy will no longer be covered. We don't want that to happen.

INTERLUDE ON ATTITUDE

Of course, if all goes well, which should be the vast majority of cases, you'll complete the ascent and safety stop using only 30 bar or even less. Now I hear people say: "But I paid for a full tank of Nitrox! I don't want to end the dive with 70 bar!" – to which my reply is: Yes you do. It's like finishing a skydive with your backup parachute still in its pack. It's a good thing. With one added wrinkle: Unlike a backup parachute, those 70 bars aren't yours. They're a shared resource. If you end a 30m dive as described above with only 20 bars left in your tank, that's a dive where you would've been no use whatsoever to a teammate with an OOG problem.

By extension, you never, ever want to complain about a buddy turning the dive when you still have a lot of gas in your tank. That buddy is conserving the portion of shared resources they're carrying, putting responsibility above ego. Don't make them regret their decision.

EXAMPLE 2

This is a shore dive. Our descent and ascent point is close to the beach, at a depth of 5m. Our target is a little shipwreck that's maybe a 10 minute swim down a sloping reef, away from our point of descent. The wreck sits at a depth of 25m, and the average depth for the swim is 15m. We expect a mild longshore current, lateral to our direction of swimming. How do we plan for something like this?

Again, we need to think through the dive and look at our potential bailout strategies. The worst-case scenario is an OOG situation at the farthest point of the dive, at 25m of depth and a 10 minute swim from our planned ascent point. Now let's think about our bailout strategy: Can we afford to surface directly from the wreck? In that case, our reserve calculation would be similar to the example above. Maybe we can, if all else fails, but I'd rather not if I can help it. Currents are usually stronger up top than near the bottom; a surface swim back to our point of exit might be difficult.

A better bailout strategy would be to swim back underwater while sharing gas. Let's do the math:

Step	Calculation	Amount
Share gas	1 min @ 3.5 ata (25 m depth) x 15 l/min x 2 divers	105 L
Swim back to the ascent point	10 min @ 2.5 ata (15 m average depth) x 15 l/min x 2 divers	750 L
Safety stop and ascend to surface	3 + 1 min @ 1.5 ata x 15 l/min x 2 divers	180 L
Total		**1035 L**

This would be just over 90 bar in an AL80, as an absolute minimum for how much we are definitely going to breathe. Our actual reserve must be larger than that. And again, there are a number of considerations.

First of all, the contingency of an emergency ascent must be covered. We need to do both calculations and apply the greater amount. Secondly, unless we regularly drill out of gas situations, we're probably not as efficient swimming while gas sharing as we would be otherwise. This is particularly true if we're using a recreational regulator configuration with a relatively short octopus hose – they're okay for direct ascents but not very convenient for long swims.

You can probably tell where this is going: If we add a safety margin of 50% to our 90+ bar, our reserve becomes 140 bar. If we apply a safety margin of 100%, then our reserve becomes 180 bar, and the conclusion is that we can't rely on this bailout strategy when diving on a single tank. In an OOG situation at the farthest point of the dive, we might be stuck with having to ascend directly from where we are and drift at the mercy of the current.

For the sake of the example, let's say we decide to turn the dive at 140 bar. If all goes as it should, swimming back takes only 40 bar per diver, and we're back in the shallows with 100 bar left in our tank. Do we need to end the dive, "wasting" all that good Nitrox? Fortunately not. Unlike the first example, where we ascend in blue water with nothing to see, this time we're still on the reef. Once back in shallow water and close to shore, our reserve requirements change. We can spend some more time, relax and take pictures, and surface when we hit our 50.

FINAL THOUGHTS

Looking at these gas planning methods, it should become clear how important it is to plan and brief every dive as a team. You want everybody to follow the narrative, think through the dive from the beginning to the end, and understand the worst-case scenario and the bailout strategy.

Be aware that your plan is only as good as your diving. If you've never practiced a gas-sharing ascent from anywhere deeper than 10m, you might want to factor that in when deciding your safety margin for 30m dives.

Debriefings are another thing. After every dive, it's important to verify that you've finished on the planned amount of gas. If not, there should be an explanation why. If nothing untoward happened during the dive but you finish with too little gas, you need a more conservative dive plan. If you end up finishing with more than you planned for on a regular basis, then maybe you can add a little extra bottom time next time. Without a debriefing, you won't know if either is the case.

Finally, especially when looking at the second example, you might realise that a single tank isn't a lot of gas when you're at the far end of a dive and fecal matter intersects with the ventilation equipment. For anything deeper than 25m or involving long swims away from shore, you might want to look at learning how to use double tanks or carry an AL40 as a redundant gas supply. You don't need to breathe all of it. You don't even want to. Like that backup parachute, you just want to know it's there.

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ABOUT THE AUTHOR

Tim Blömeke teaches technical and recreational diving in Taiwan and the Philippines. He is also a freelance writer and translator, as well as a member of the editorial team of Alert Diver. For questions, comments, and inquiries, you can contact him via his blog page or on Instagram.

GAS PLANNING 101:
HOW TO CALCULATE YOUR RMV

BY **TIM BLÖMEKE**

Respiratory minute volume or RMV, also referred to as SAC rate (for Surface Air Consumption) or SRC (Surface Consumption Rate) is the volume of breathing gas that passes into and out of a person's lungs, on average, per minute.[1] It varies from person to person. Knowing one's RMV is essential for more advanced dive planning because it enables one to predict how long a given gas supply will last at a given depth. RMV is measured in litres per minute.

This article explains how to calculate your RMV from submersible pressure gauge (SPG) readings before and after the dive, the cylinder size, and the average depth and dive time logged by your dive computer.

FREE LITRES OR, HOW MUCH GAS IS REALLY IN MY TANK?

We usually indicate the amount of gas in our cylinder in terms of pressure. That's fine for communication during a dive, but for planning, we need to get a little more detailed. After all, a bigger tank at 200 bar holds more gas than a smaller one, doesn't it? How about a 15 litre tank at 160 bar compared with an 11 litre tank at 200? Here's where the concept of free litres comes in.

A free litre is the amount of gas that occupies a volume of one litre at a pressure of one atmosphere (1 ata or 1.013 bar, treated here as equal to 1 bar for practical purposes). In this article, we will use L (capitalised) as the unit symbol for free litres and l (lowercase) for litres in the regular sense.

The neat thing about this unit is that we can use it to describe how much gas is in a scuba cylinder, by multiplying the size of the cylinder with the pressure. For example, when released to the atmosphere (1 ata), the gas in a 10 litre cylinder pumped to a pressure of 200 bar would occupy a volume of 2000 litres (10 l x 200 bar). In other words, the cylinder contains 2000 free litres of gas. Now we can answer the question above: 15 l x 160 bar = 2400 L is more than 11 l x 200 bar = 2200 L.

We are now also able to quantify the exact amount of gas we use on an individual dive: eg, if we start a dive at 210 bar, finish it at 60 bar, and are using a 10 litre cylinder, we calculate: gas used = (210 bar – 60 bar) x 10 l = 1500 L

BRINGING IN THE COMPUTER LOG

Just knowing how many free litres we used on a dive doesn't tell us our RMV. As we learned during our initial training, gas use is proportional to the ambient pressure (P = 1 ata at 0m, 2 ata at 10m, 3 ata at 20m etc., or P = 1 + depth in metres/10 ata), and of course to dive time. To arrive at our RMV for a given dive, we therefore have to divide the amount of gas used by the dive time (T) and the dive's average ambient pressure (P), calculated from the average depth found in our computer log.

Our final formula is: RMV (in l/min) = gas used/(Pressure * Time)

Example: Let's say you did a 45 minute dive. Your cylinder has a volume of 12 litres, your starting pressure was 200 bar, and you finished at 60. Your computer log tells you that the average depth for the dive was 12 metres. Your RMV is (12 l * 140 bar)/(2.2 ata * 45 min) = 17 l/min.

Note that a diver's RMV is an average value that will vary somewhat depending on circumstances (eg, workload, stress, thermal comfort). It also tends to decrease with experience and increase when a diver hasn't been in the water for a while. RMV calculations should therefore be performed on a regular basis. For safety, any fractions should be rounded conservatively, ie, treat 13.4 l/min as 14 l/min.

USING RMV IN DIVE PLANNING

Once you know your RMV, you can reverse the process above to predict how much gas you will use on a dive you are planning. For example, if your RMV is 16 l/min and you want to spend 25 minutes at 25 metres, you can expect to use 16 l/min * 25 min * 3.5 ata = 1400 L of gas for that segment of the dive. In a standard AL80 aluminium cylinder (11 litre volume), that would be 1400 L / 11 l = 127 bar, rounded up to 130 bar.

Since dive planning usually happens in a team, a team should use the highest RMV among its members as the basis for planning.

FINAL NOTE: DON'T BE THAT PERSON

Different people have different gas consumptions, and using a lot of gas can be a touchy subject for some. Having a low RMV is nice, but please don't think that makes you a better diver – a diver's RMV depends on a variety of physiological and environmental factors. Yes, RMV needs to be discussed during dive planning, but in a strictly factual manner. Don't judge. Most importantly, don't brag. Like with certain body parts, even if you're very proud of yours, that doesn't mean everybody wants to hear about it.

Happy planning, and stay safe, always!

[1] According to the US Navy Diving Manual, "the respiratory minute volume is calculated by multiplying the tidal volume by the respiratory rate."

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Sunday 10th December 2023 | 7am-11:30am | JA The Resort, Jebel Ali

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EDA will have a stand at the Blue Mind Zone. You can collect a copy of the December magazine issue, and our T-shirts will also be available (Members Price: AED45 | Non-members: AED95). Drop by for a catch up and join us for the paddle out.

Buy your tickets here: **https://bit.ly/3R68lTr**

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For more information, go to: **www.emiratesdiving.com/events/reef-check**

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