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Malapascua Thresher Sharks

Spain España Wreck

Papua New Guinea Kimbe Bay

UW Photo Freediving

Biodiversity Coral Triangle

Koh Tao Sattakut Wreck

Portfolio Jason deCaires Taylor

THAILAND'S Khao Lak

COVER PHOTO BY DR RICHARD SMITH

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Honeycomb moray eel on *Boonsung* wreck, Khao Lak, Thailand. Photo by Kate Clark



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COVER PHOTO: Denise's pygmy seahorse, Wakatobi, Indonesia
Photo by Dr Richard Smith



Middle East Malaise

The perfect combination

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"We spent the first week on Pelagian and the 2nd week on the island. The Pelagian was spacious and comfortable, like being in a 5 star hotel! Wakatobi resort was just as amazing - staff, accommodation, food, diving - all out of this world. Dive instructors ensured your experience was personal and you got the best out of your trip."

Nicola Willis, August 2014



www.wakatobi.com

I have always held a deep fascination for the Middle East; it is hard not to. It's exotic, exciting and intriguing but also sometimes tragic.

It is the cradle of civilisations and innumerable cultures, and through millennia, the stage of a complex and long history that has profoundly affected the rest of the world, including but not limited to being the birth place and center of the three big, present-day, monotheistic religions—Judaism, Christianity and Islam.

The Red Sea is one of the best and arguably most known dive destinations in the world. For European divers in particular it was only logical next step beyond the Mediterranean once flights began to become affordable for common people during the last half of the 20th century.

In no small measure thanks to both its relative proximity, cheap package deals and the plentiful availability of quality operators, it remains a very popular destination not just for divers but also for sun-starved northerners seeking a mid-winter escape.

Then, as now, only the geekiest of divers would remain ignorant of the history and landmarks in

the hinterland. If you have the pyramids at Giza, the ancient temples at Luxor or Jordan's Petra within range of a day trip from your dive resort, how can you just not go, even if it means 'missing' a whole day of diving?

While the Middle East has also been the center of much turmoil, it has also been a wonderful place to visit. From Egypt's majestic deserts and secretive bazaars, to Israel's and Palestine's holy lands, Jordan's Petra and Wadi Rum to Eastern Turkey's mysterious regions, just to name a few, I have always felt safe and generously welcomed. I can't wait to go back, history and guidebooks in hand.

As the region—Egypt in particular—is also so dependent on tourism for income, it has been troubling to witness how all the upheavals, revolutions and unrest, most of all, have hurt the common people who eek out a living in the local hospitality industry. Often whole families are dependent on such breadwinners.

So when the Moslim Brotherhood and the military establishment clash in Egypt, or when Hamas and the Israelis get into an armed conflict over Gaza for months, what do we as dive travellers do? Do we say bug-

ger all and go anyway minding our own business, focusing on getting a tan and a bunch more dives logged, with no or little regard of the suffering going on elsewhere?

Or do we stay at home or take our money elsewhere, leaving the locals, including the dive industry, to somehow weather it out on their own and hopefully reemerge alive on the other side?

And if we do go, do we end up endorsing or supporting, or appearing to do so, one party over the other in some sad conflict in which we do not want to take sides other than that of grieving parents and kids being orphaned?

The late U.S. diplomat and emissary Richard Holbrook once said, in what has since become a favourite quote of mine: "Conflicts are created by people, therefore they can be solved by people." At a different occasion he also said, "A peace deal requires agreements, and you don't make agreements with your friends, you make agreements with your enemies."

Now if people would only wise up and listen ...



News edited
by Peter Symes

NEWS

from the deep



The larvae of the vagabond butterflyfish (*Chaetodon vagabundus*) spend more than a month in the ocean waters before seeking out a reef.

Certain aquatic species that appear to be passively floating through the water may in fact make active choices about where to settle

Reef fish follow their noses ...

Juvenile fish and corals gravitate toward reefs dominated by healthy corals while specifically avoiding species of seaweed known to colonize degraded reefs.

If fish and coral larvae opt to settle in coral-dominated areas instead of the degraded, seaweed-dominated reefs ecologists' efforts to restore reefs could become complicated.

With a series of experiments, a team of researchers led by Danielle Dixon from Georgia Institute of Technology compared water from marine protected areas, where

fishing is restricted and corals abound, to water from non-protected areas, where seaweed has largely replaced both corals and fish on the reefs.

Eeeeww!

They found that chemical cues expressed by healthy corals attracted coral larvae and young reef fish while

... which is why Marine Protected Areas might not be quite enough

Damaged coral reefs emit chemical cues that repulse young coral and fish.

Designating overfished coral reefs as marine protected areas may not be enough to help these reefs recover because chemical signals continue to drive away new fish and coral long after overfishing has stopped.

The study by Georgia Institute of Technology shows for the first time that coral larvae can smell the difference between healthy and damaged reefs when they decide where to settle and that young fish have an overwhelming preference for water from healthy reefs. Chemical signals from seaweed repel young coral from settling in a seaweed-dominated area. Young fish were also not attracted to the smell of water from damaged reefs.

The new study examined three marine areas in Fiji that had adjacent fished areas. The country has established no-fishing areas to protect its healthy habitats and also to allow damaged reefs to recover over time.

Coral larvae repelled

Juveniles of both corals and fishes

were repelled by chemical cues from overfished, seaweed-dominated reefs but attracted to cues from coral-dominated areas where fishing is prohibited. Both coral and fish larvae preferred certain chemical cues from species of coral that are indicators of a healthy habitat, and they both avoided certain seaweeds that are indicators of a degraded habitat. □

Not only are coral smelling good areas versus bad areas, but they're nuanced about it.

— Professor Mark Hay



Patagonia's Peninsula Valdés teeming with wildlife

Argentinean wildlife haven declared Biosphere Reserve

Four million acres in Patagonia declared Biosphere Reserve by UNESCO.

Situated in Argentina's Patagonia region, the rugged Peninsula Valdés in Chubut Province is teeming with wildlife. The area is home to the largest breeding colony of southern elephant seals in South America as well as 70,000 pairs of Magellanic penguins, over 10,000 South American sea lions, cormorants, gulls, terns and nearly 4,000 southern right whales, nearly one third of the world's

remaining breeding population. On land, the peninsula supports over 4,000 guanacos and some of the highest densities of maras and Darwin's rheas in Patagonia.

The new reserve encompasses over four million acres and will be divided into core areas, buffer zones and transition areas. The designation includes a previously unprotected area known as Punta

Ninfas and increases protection for the wildlife and its adjacent coastal waters.

"Península Valdés is one of the great natural wonders of Latin America with greater concentrations of wildlife than any other area on the entire coast of Patagonia," said WCS President and CEO Cristián Samper. "Making this incredible area region a UNESCO Biosphere Reserve is the culmination of years of hard work by many great partners."

The new Biosphere Reserve was designated by the International Coordinating Council of the UNESCO Man and the Biosphere Programme at its 26th session in Jönköping, Sweden. The designation means the region, currently a provincial protected area, will work to reconcile sustainable economic growth, social development, and environmental protection. □

Kaikoura on New Zealand's South Island becomes a MPA

A new marine reserve, whale and fur seal sanctuary, five customary fishing areas and amateur fishing regulations to improve the management of Kaikoura's coast and ocean.

The new marine protection measures include the 10,416 hectare Hikurangi Marine Reserve in very deep waters, the 4,686 square kilometer Kaikoura Whale Sanctuary, which extends 45 kilometers north and south of the Kaikoura peninsula and 56 kilometers out to sea. It protects the sperm, humpback,

southern right, blue, killer and other whales that frequent the area and prohibits high-level seismic survey work; and three small maitaitai reserves are to be established at Mangamaunu, Mussel Rock and Orou in which commercial fishing is prohibited and which protect customary fishing beds. □

Scottish government announces 30 new MPAs

The new Marine Protected Areas will protect a further 12 percent of Scotland's seas and double the size of an emerging network of MPAs.

The network includes what is thought to be Europe's largest marine protected area (MPA) in the far northeast of U.K. territorial waters, in the northeast Faroe Shetland channel, to conserve deep sea sponges, muds and geological features.

The Nature Conservation MPA network consists of 17 MPAs under the Marine (Scotland) Act 2010 in Scottish territorial waters and 13

MPAs under the Marine and Coastal Access Act 2009 that have been recommended by Scottish Natural Heritage and the Joint Nature Conservation Committee. As the new MPAs were confirmed, the official conservation agency Scottish Natural Heritage recommended that four extra MPAs should be considered to protect minke whale, Risso's dolphins and basking sharks—species not included in the new designations. □

Lots of new Marine Protected Areas

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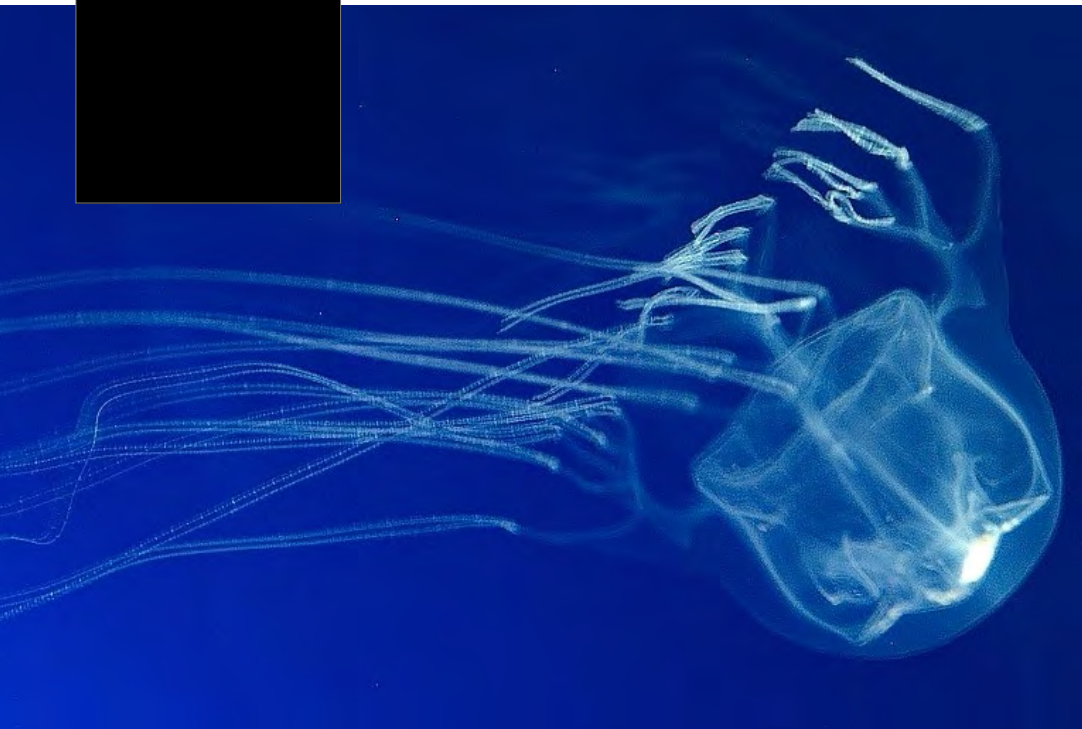
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Michael Lawrence



OPEN CAGE

The tiny and transparent irukandji jellyfish is difficult to detect in open water

Dangerous jellyfish blooms are predictable

Australian scientists found most Irukandji stings occurred during the summer when south easterly trade winds along the shore were less persistent.

Irukandji jellyfish are quite small but extremely venomous jellyfish that inhabit marine waters of Australia. Irukandji syndrome is produced by a small amount of venom, and victims usually require hospitalisation. When properly treated, a single sting is normally not fatal, but two people in Australia are believed to have died from Irukandji stings in 2002.

Jellyfish are not strong swimmers and their movements are largely directed by current and waves. Each year 50-100 people are hospitalised in Australia due to stings

from irukandji jellyfish as the tiny and transparent jellyfish is almost impossible to spot.

Currently beach closures and other warnings are based on confirmed Irukandji stings or sightings—a strategy that is both costly for the tourism industry and relies on some people being stung.

The connection between stings and wind conditions could indicate that interventions based on wind monitoring might be a more effective strategy for reducing stings. □

Fish need to decompress too

The California Academy of Sciences is using a unique hyperbaric decompression chamber to prevent piercing the swim bladder when bringing up fish from the deep.

Aside from burst swim bladders, fish, like humans, can also get decompression sickness when exposed to rapid changes in pressure during capture.

“Bent” fish are most likely widespread in the live reef fish trade, as most of the species that have been examined were found to suffer symptoms of decompression sickness after capture from shallow depths of 10 to 15 metres.

Invisible damage
Although most of the

barotrauma damage occurs internally and thus is invisible, there are some external symptoms. At any given depth, a fish's body will absorb nitrogen gas through the gills and into the blood stream until equilibrium and saturation is reached.

If decompression is slow, the excess nitrogen can be removed via the blood to the gills. During capture of the fish, however, rapid decompression saturates the rate of nitrogen elimination. The stationary bubbles

that accumulate in the bloodstream and tissues lead to the symptoms of decompression sickness.

In many fish, especially benthic dwellers that do not usually swim up and down the water column, the drastic increase in the volume of gas during depressurisation at capture will inflate the swim bladder. The size of the inflated swim bladder at the surface increases with depth of capture and the swim bladder will rupture when the volume of gas becomes too great. □



PETER SYMES

Anthias (file photo). According to CAS a fairly simple chamber can bring a fish up to to surface pressure in around 20 hours or so without adverse effects

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Carlos Vilch





SCOTT BENNETT

(File photo: Parrotfish) Spots around the eyes potentially act as miniature light sources

How sea creatures change colour

Deep-diving fish have a dilemma. With blue and green the only light penetrating their environment, flashy colour patterns are limited to a minimalist palette. A new study has revealed the fishes' solution. In deep water, they simply fluoresce more, a technique allowing them to convert blue-green light into red.

"Under light conditions that do not provide the full spectrum—the full rainbow of colors that we have at the surface—it's really nice to have fluorescence, because you can still have those missing colors," said study researcher Nico

Michiels, professor at Germany's University of Tübingen.

Most colour pigments absorb some portions of the light spectrum and bouncing the rest back. For example, a yellow flower absorbs blues, greens and reds, sending yellow shooting back toward the eye of the observer.

Slightly different

Fluorescence is slightly different, with responsible molecules absorbing one wavelength of light and emitting another longer wavelength. This occurs through a process of excitation, where the molecule absorbs light energy and then emits a lower-energy wavelength than the one it absorbed in order to return to its resting state.

Many marine animals exhibit fluorescence, frequently in colors

not visible to the human eye without filters. Researchers studying fluorescent corals have suggested these colours may offer protection against sun damage. Another theory suggests fluorescence provides marine organisms more freedom of color, thus enhancing communication and camouflage.

Fluorescence at depth

Michiels and his colleagues dove to depths of 5m and 20m at sites in the Mediterranean, Red Sea and East Indian Ocean. Specimens of eight known fluorescent species were collected, including five types of goby and a pipefish. Back on land, the fish were housed in aquariums and tested for fluorescence the same day.

Spectrometer measurements revealed fish caught at depths of

Randy toadfish kept Californians awake at night

Toadfish are known for their ability to produce sound with their swim bladders and that is exactly what residents around Monterey Bay in the U.S. state of California found out the tedious way, by being kept awake by the fishes loud sex call. The sound was being heard by residents living about a quarter-mile away from the Monterey Bay Aquarium.

The endless motor-like sounds are produced by their strong muscles pressing against their balloon-like bladders. They hit the bladder about 6,000 times a minute—twice the speed of a hummingbird's wings—and do it during a mating season that usually starts in May and ends in September. The loud hum can last for more than an hour at a time. □



WIKIMEDIA COMMONS

Why corals need more parrotfish

A decline in parrotfish (see image) and sea urchin numbers is a bigger cause of Caribbean coral loss than global warming, a new report suggests, and by increasing these populations the reefs have a chance of recovery.

These species are the area's two main grazers and the loss of them breaks the delicate eco-balance of corals and allows algae, on which they feed, to smother the reefs. □

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Diver inspects
the boilers of
the wreck of
España

Text and photos
by Vic Verlinden

The battleship *España* has a very important place in the history of the Basque Country of northern Spain and is now a protected monument at the bottom of the sea.

In August 1915, the battleship was originally christened the *Alfonso XIII* after the current king of Spain, in the shipyard of Vickers-Ferrol and had two sister ships named *España* and *Jaime I*. The First World War was going on in Europe, but Spain was neutral, so the ships were not brought into the conflict. When King Alfonso XIII was deposed in 1931, the ship was re-christened with the name of *España*, after her sister ship, which ran aground off the coast of Morocco. At the outbreak of the civil war in 1936, the *España* was seized by General Franco, who was the leader of the Nationalists.

On the 30 April 1937, the ship

was sailing along the coast of Santander near Bilbao. Suddenly, there was a large explosion in the middle of the ship, and the *España* capsized rapidly. The captain immediately ordered all available lifeboats into the sea. Another marine ship named

Velasco came to assist the stricken vessel and rescue a few survivors from the water. Some members of the crew died in the explosion and others were unable to escape when the ship sank to the bottom of the sea. After the disaster, it was

apparent that the ship hit a mine installed by the military's own troops.

Expedition preparations

Facebook is an excellent instrument to find new diving sites, and it was with

the help of this medium that I found the first underwater pictures of this wreck. They were taken by Sabine Kerkau from Switzerland.

For several years now, I have wanted to dive the Atlantic coast, so I contacted



España Wreck

—The Disappearance of a Prestigious Battleship





Diver with remains of a cannon or gun battery (above) and scattered artillery shells (right); Diver at the propellor of the *España* (far right)



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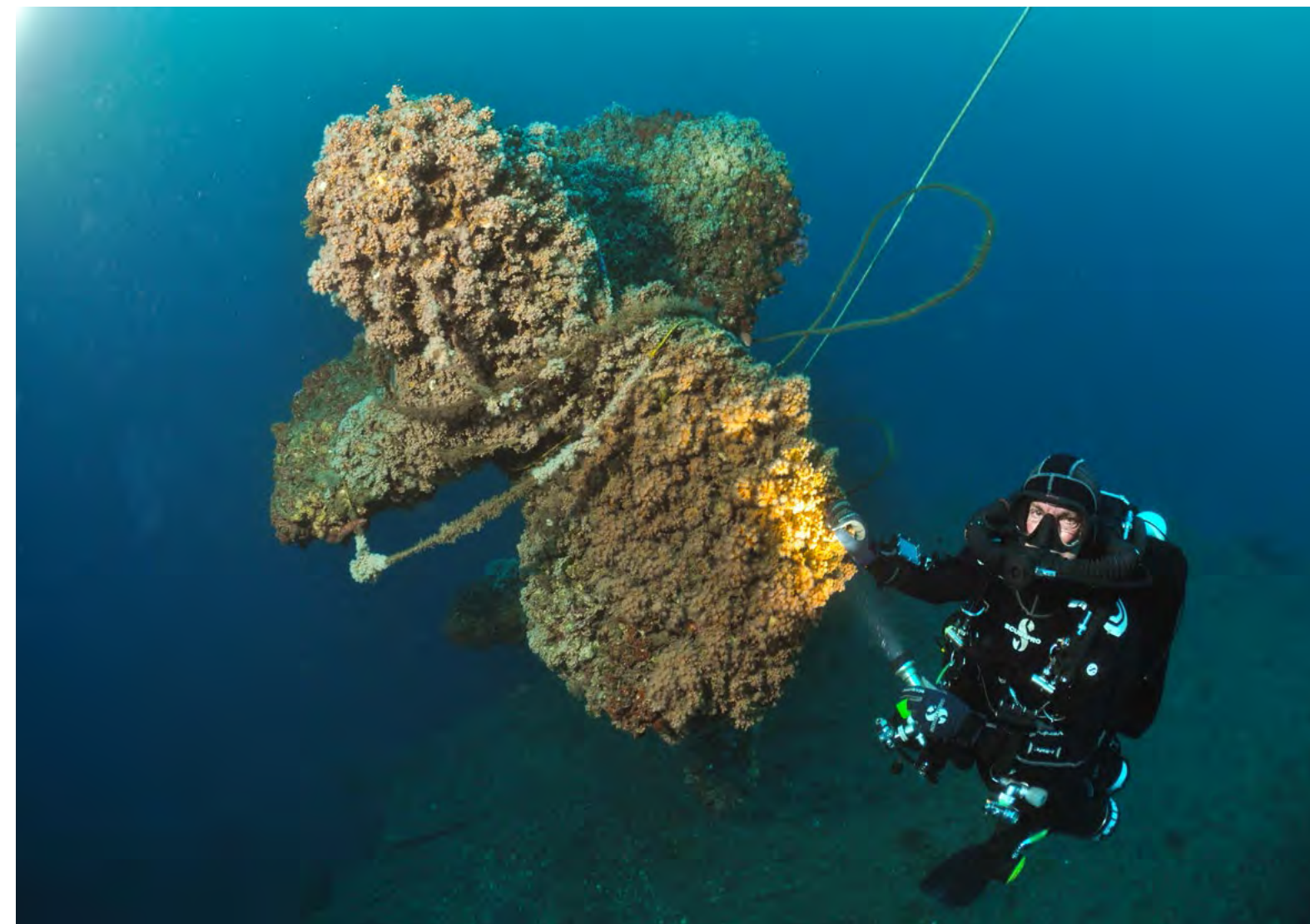
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Kerkau right away. She said she would be returning to Spain in a few months to do more dives on the wreck, and said I could come along and join their group. The problem for me, with diving in this neighborhood, was the language. Almost nobody speaks foreign languages there, and I

did not speak Spanish. Happily Kerkau could contact somebody on the spot who spoke English. This was Alberto Marin, a tech diver and all-around nice guy, who would accompany me during the test dive on a wreck at a lesser depth than *España*. We agreed to make the trip in

August when there were more chances for good weather. Sometimes the ocean can be wild around Bilbao, with stormy seas. It is impossible then to get the boat out and go diving. After a ride of more than 1,300km, we finally arrived at the city of Laredo. This inshore city





Technical diver
Sabine Kerkau filming
the *España* wreck

España

sinking, I was able to see one of the big propellers distinctly when I hovered over the hull.

After a quick check of equipment with my buddy, we descended further along the side of the hull. The hull was more damaged at this point, and we could also make out a pile of artillery shells. It was obvious that this was one of the ammunition rooms and that the shells were used for the large guns.

Near the bottom there was a hole in the hull. I decided to swim inside and have a quick look because I suspected that it was probably the captain's cabin. Inside the wreck, everything was turned over upside down, so I could only recognize a washbasin and a toilet. At

this depth there was, of course, not much time to linger, so after one more little turn around the propellers, we decided to ascend to the surface.

140m-wide seamen's grave

The next day we conferred with the group about the dive plan for the day and decided to explore the mid-section of the ship. Arriving on location, we found the anchor was still placed near the propellers, but when we got to the wreck, we immediately turned heading north.

The hull was more damaged here, and we could distinctly see the Yarrow boilers. A few meters further, there was also an intact copper pump screwed up against

has a marvelous sandy beach and is visited by a lot of Spanish tourists during the summer holidays.

Genovieva Fierro test dive

After a good night's rest, it was time to meet my dive buddy and the owner of the diving center. Joseba Alberto, who has made of Mundo Submarino a modern dive center with all the resources necessary for technical diving. After a friendly welcome, we met up with Marin, who would accompany me during the dive.

The first dive was planned for that afternoon, so we immediately began to prepare our gear. We expected a depth of about 55 meters on the wreck and prepared our gasses for these specifications. The first dive to a new destination is always carefully planned, so I concentrated my attention on my task of setting up the rebreathers.

The wreck we were diving this time was a freighter that sank during the Second

World War. The wreck rested at a depth of 55m and was quite intact. Because it stood upright on the sea floor, we had no difficulties exploring the entire wreck. We could easily recognize the winches that activated the different cranes as well as a part of the ship's structure.

My rebreather was working perfectly during the dive and so I was sure I would be ready for our dives on the *España*. As my buddy, Alberto, had an excellent dive, too, we planned the dive on the *España* for the following day. Of course, we hoped for good weather to enable our long trip on the dive boat to the wreck.

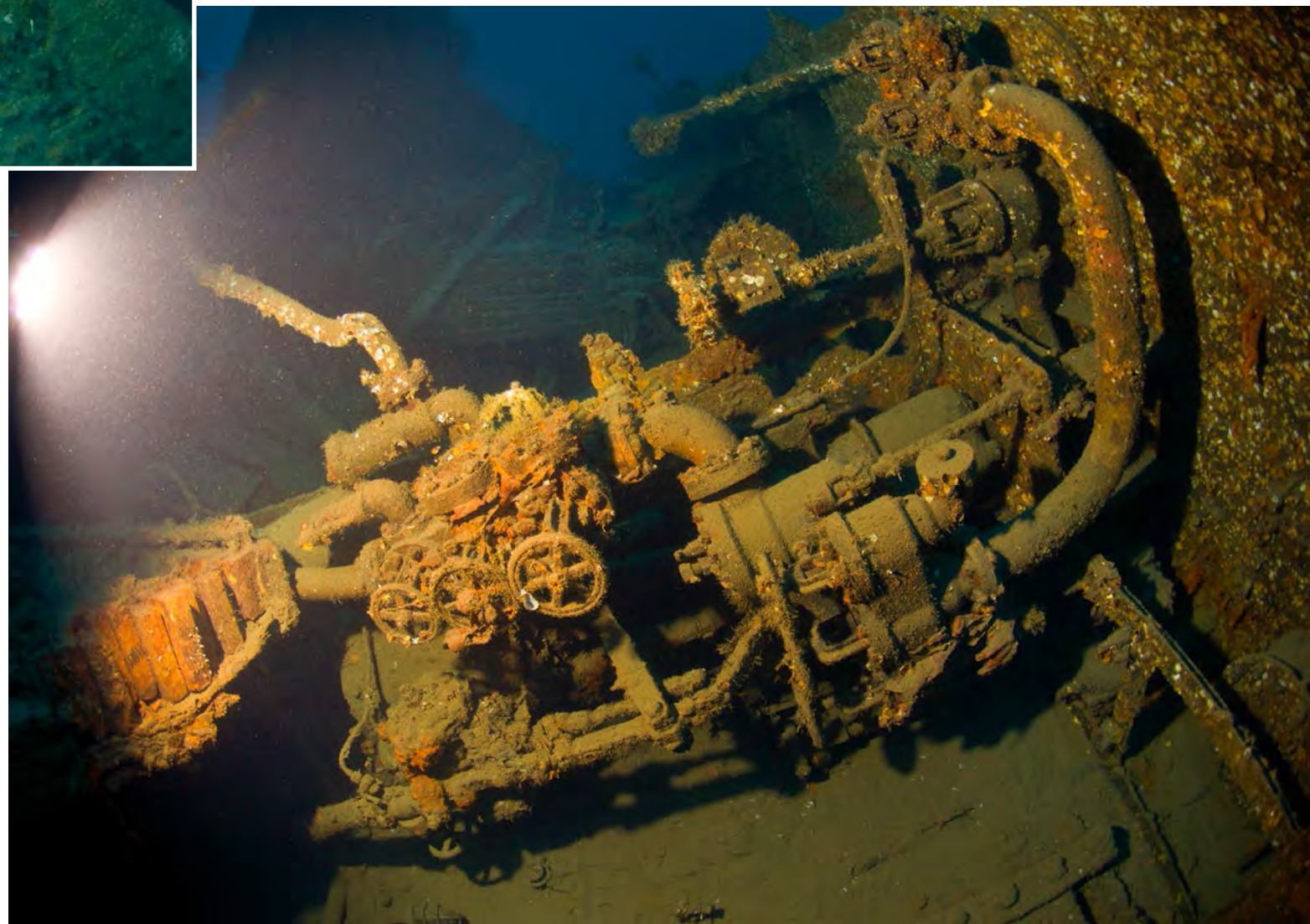
Exploration of captain's cabin

Fortunately, the weather was excellent when we met at the dive center as planned. We took the necessary time to set up and test all our equipment again. The *España* lies at a depth of 70m, so we could not run the risk of any faulty gear. Luckily, when we cast anchor at

the wreck, the sun was shining and there was a light breeze.

For this dive I was placed with a group of three composed of myself, Marin and Kerkau, who came by plane from Switzerland especially for this dive. Marin cast the grapnel near the stern of the wreck, as it was our intention to explore this part of the ship.

Going down I noticed that the visibility was more than 15m. At 50m we saw the shadow of the wreck becoming visible right under us. Because the ship turned over under the weight of her guns during the



Pumps on the wreck of the *España*



View inside the engine room

the side of the ship. When we arrived near the middle of the wreck, we saw a passage that allowed us to swim to the other side. Here, we found the large turret of the gun battery sitting on its side on the wreck. We also saw one of the smaller 100mm guns against the sidewall.

The visibility was even better today, and in some places, it was almost 20 meters. We decided to swim back in the direction of the stern of the ship so that we would not be too far away from the anchor line for the ascent to the surface. After a signal from my buddy, I sent my deco buoys to the surface and began the long decompression. This was only a little sacrifice for the magnificent dives on this unique wreck. I will certainly come back! □



Diver and washbasin on wreck of the España



Historical photo of the España

Having dived over 400 wrecks, Vic Verlinden is an avid, pioneering wreck diver, award-winning underwater photographer and dive guide from Belgium. His work has been published in dive magazines and technical diving publications in the United States, Russia, France, Germany, Belgium, United Kingdom and the Netherlands. He is also the organizer of tekDive-Europe technical dive show. For more info, visit: www.vicverlinden.com

THE ESPAÑA
Owner: Spanish Navy
Builders: Vickers Ferrol Dockyard 1912
Type: Battleship / Cruiser
Tonnage: 15,254 tons
Length: 140m
Width: 26m
Propulsion: Turbine motors, 3 propellers
Speed: 20 knots

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Front
mounted
cannon
on HTMS
Sattakut
wreck

Text by Nick Shallcross
Photos by Nick Shallcross
and Charly Severino

On a cold day in February 1944, little would the workers of the Commercial Iron Works in Portland, Oregon, have known of the fate and unlikely resting place of the USS LCI(L) 739—now known to those who visit her as the HTMS *Sattakut*. This was just one of the many ships built in the aftermath of Pearl Harbour, which saw the entry of the United States into World War II. The Americans were keen to exact revenge and stop the advance of the Empire of Japan across Southeast Asia, but for this they needed more ships. After seeing out her years in both the U.S. and Thai navies, The HTMS *Sattakut* has now found her final resting place in the Gulf of Thailand just off a little island called Koh Tao.



HTMS *Sattakut*





Troops exiting a Landing Craft Infantry during WWII; Beach landings at Okinawa during WWII (below center); 1945 U.S. postage stamp commemorating the Battle of Iwo Jima with the iconic photograph, *Raising the Flag on Iwo Jima*, by Joe Rosenthal (bottom right)

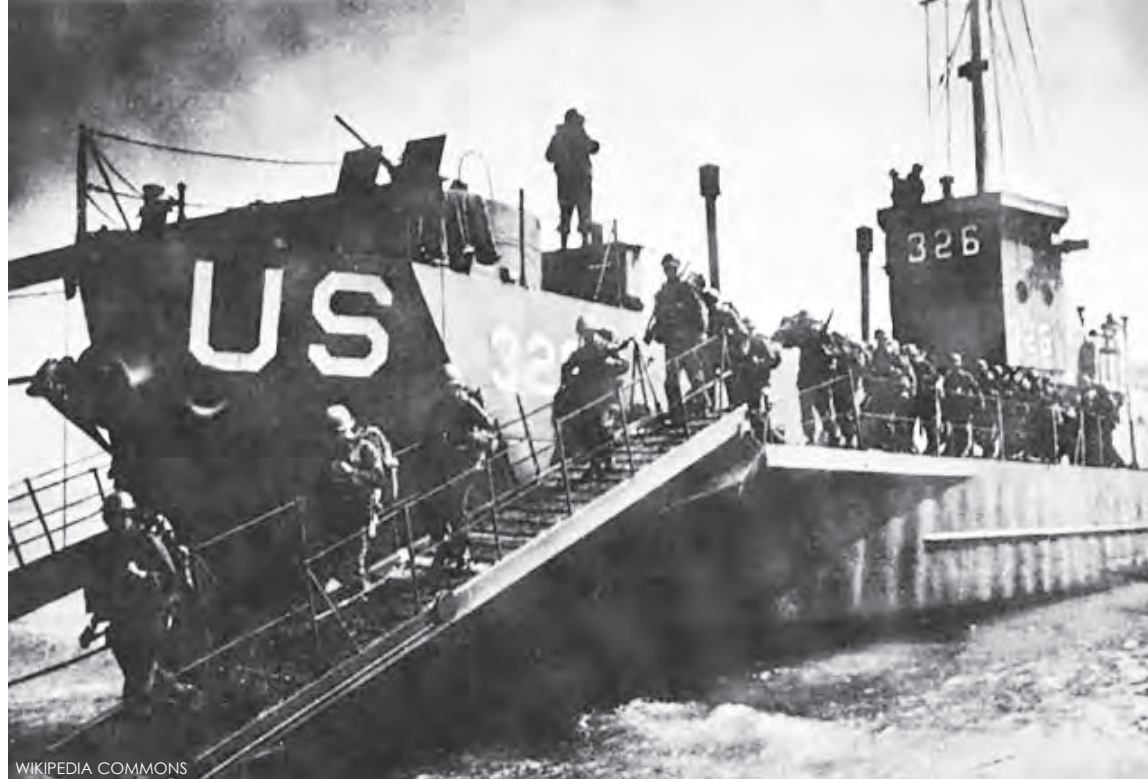
During the War

Commissioned on February 27 as a Landing Craft Infantry Large, she was assigned to the Asiatic-Pacific Theatre to assist with the war efforts against Japan. It was in September of that year when she finally saw action in the long running battle between the two superpowers when she participated in the capture and occupation of southern Palau islands between September and October of 1944.

With American military leaders predicting the invasion would last just a matter of days, it was soon clear that the Japanese had learned from previous mistakes and had themselves dug well into the hills behind the beach. Their strategic position led to one of the largest losses of life for U.S. forces in the Pacific, with their landing craft and troops reaching the beach amid

heavy fire from machine guns and artillery. The slow but steady advance of American Marines did, however, eventually lead to the surrender of the Japanese army on the island, with both sides incurring heavy losses.

With the Palau islands secure, U.S. forces moved on, securing other key islands and airfields in an attempt to cripple the Japanese and halt their advance across the Pacific. One such island would become part of one of the most controversial decisions made during the war, the invasion and occupation of



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Iwo Jima.

The 739 was reclassified to the USS LCI Gunboat 739, with the addition of larger guns, providing her with the much-needed firepower to deal with the heavily

defended Japanese. The naval fleet bombarded the island with shelling and mortar fire for three days running up to the landings, with little impact to the Japanese in their dugouts. Even with the piece of land being deemed useless to both the U.S. Navy and Air Forces, what followed was a gruesome and bloody five-week battle that saw more American troops killed or wound-

ed than Japanese forces for the first time in the war.

Although American success was almost guaranteed, the Japanese showed impressive military tactics in their defence of the island. With nowhere to retreat to, U.S. forces finally overcame the resilient Japanese, leading to one of the most iconic photographs of the war, *Raising the Flag on Iwo Jima*, by Joe Rosenthal.

The USS LCI 739's next action came later that month during the invasion of Okinawa, the largest amphibious assault of the Pacific war. Landing craft such as the 739 played a huge



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Photo courtesy of Jill Heinerth



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Troops loading up ready for deployment





role in the invasion and were used for a variety of roles throughout this campaign.

As well as transporting troops for beach landings, they carried out vital roles including protecting underwater demolition divers, and creating smoke screens to hide the advancing fleet from enemy aircraft and artillery. For this, the 739 was armed with even more firepower, and was reclassified to a Landing Craft Infantry Mortar, with the addition of large heavy mortar cannons.

Between March and June of 1945, both sides suffered large loss of life throughout the long and gruelling invasion. However, the eventual capture of the island played a major role in the American advance. Situated just a short distance from mainland Japan, it gave the Americans the perfect base for their final assault on the Japanese.



THIS PAGE: Scenes from the sinking of HTMS *Sattakut*. The ship lists in its intended position waiting to be sunk while sailors look on from some of vessels in the large Thai Navy flotilla attending the event

a mecca for recreational divers.

The vessel spent some time being stripped clean by the Department of Marine and Coastal Resources, readying for its final goodbye, leaving an empty shell with both the bow and stern cannons still attached.

The atomic bombings of Nagasaki and Hiroshima, which came just a few months later, finally bought an end to the war in the Pacific, and after 1946, most Landing Craft Infantry were retired from duty and were either sold, scrapped or transferred to other nations. The 739 was one such vessel, and after receiving three battle stars for her services during the war, she was transferred to the Royal Thai Navy and reclassified as the LCI 742 or HTMS

Sattakut, where she would see out her years helping to transport Thai troops for training and duties.

The sinking

As part of an artificial reef project in Thailand, the HTMS *Sattakut* as well as many other vessels were donated by the Thai Navy to a number of locations around the country. It was chosen that the HTMS *Sattakut* would be sunk off the coast of Koh Tao, a small island in the Gulf of Thailand, and

All electronics, contaminants and engine parts were removed before she was deemed fit to sink.

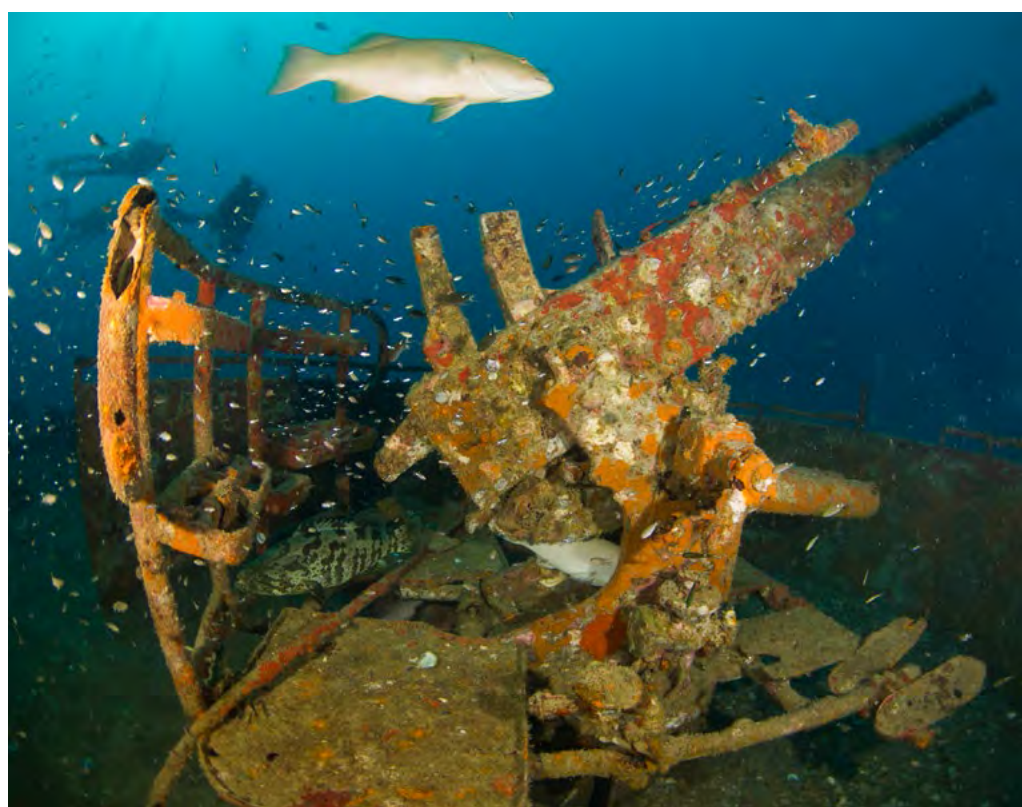
On 18 June 2011, accompanied by a large flotilla from the Thai Navy, plus dozens of local dive boats keen to watch the vessel go down, the ship was towed into her intended position. In typical fashion, not everything went exactly to plan, with Mother Nature doing her best to intervene. Large waves, strong wind and a wall of sideways rain rolled





in causing many of the onlookers to head back to the harbour leaving just the Thai Navy and a few dedicated spectators to watch her final act.

The rough weather caused the ship to drift out of position and roll over as she went down. She landed on her side on the sea floor slightly off from the intended area. A small amount of damage was done to the wreck as she hit the sea floor in a great cloud of silt, but this did not deter the hoard of local divers keen to get the first glimpse of Koh Tao's latest wreck. After a few days to let the silt and the wreck settle, the Thai Navy declared the wreck safe to dive and the divers rushed out and began diving her straight away.



Fish pass by the rear mounted gun on the wreck of the HTMS *Sattakut*





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View from inside the old wheelhouse (top left); Bow of the *Sattakut* looms overhead (left); Diver exploring the wreck's interior (below)



After around a month of successful diving, the decision was made to raise the wreck, placing her upright and in her intended position, away from the busy shipping lane. Diving was halted while a team of salvage experts was assembled, and with the help of a large crane and platform, the ship was moved to the position she can be found in today. Laying in around 30m of water just a minute swim from the large granite pinnacles of the neighbouring dive site, Hin Pee Wee, she sits in the ideal position to be accessed year round by divers of various levels of experience.



The wreck

The wreck of the HTMS *Sattakut* has quickly become one of the most popular dive sites to visit on the island. Everyday, avid divers and students completing their Advanced Open Water, deep or wreck courses visit to marvel over the 48m-long ship.

Over the three years she has been down, the wreck has become home to a huge abundance of marine life from tiny flatworms and nudibranches to large schools of snapper and trevally. Even a few of the famous yet illusive Koh Tao whale sharks have been spotted passing by the wreck in the clear blue water.

Inside the wreck, schools of tiny glassfish and juvenile barracuda can sometimes be found hiding in the safety of the large



empty hull.

Descending down the buoy line, the first thing to appear is

the large front mounted cannon on the bow of the ship, an exciting sight for the newly cer-



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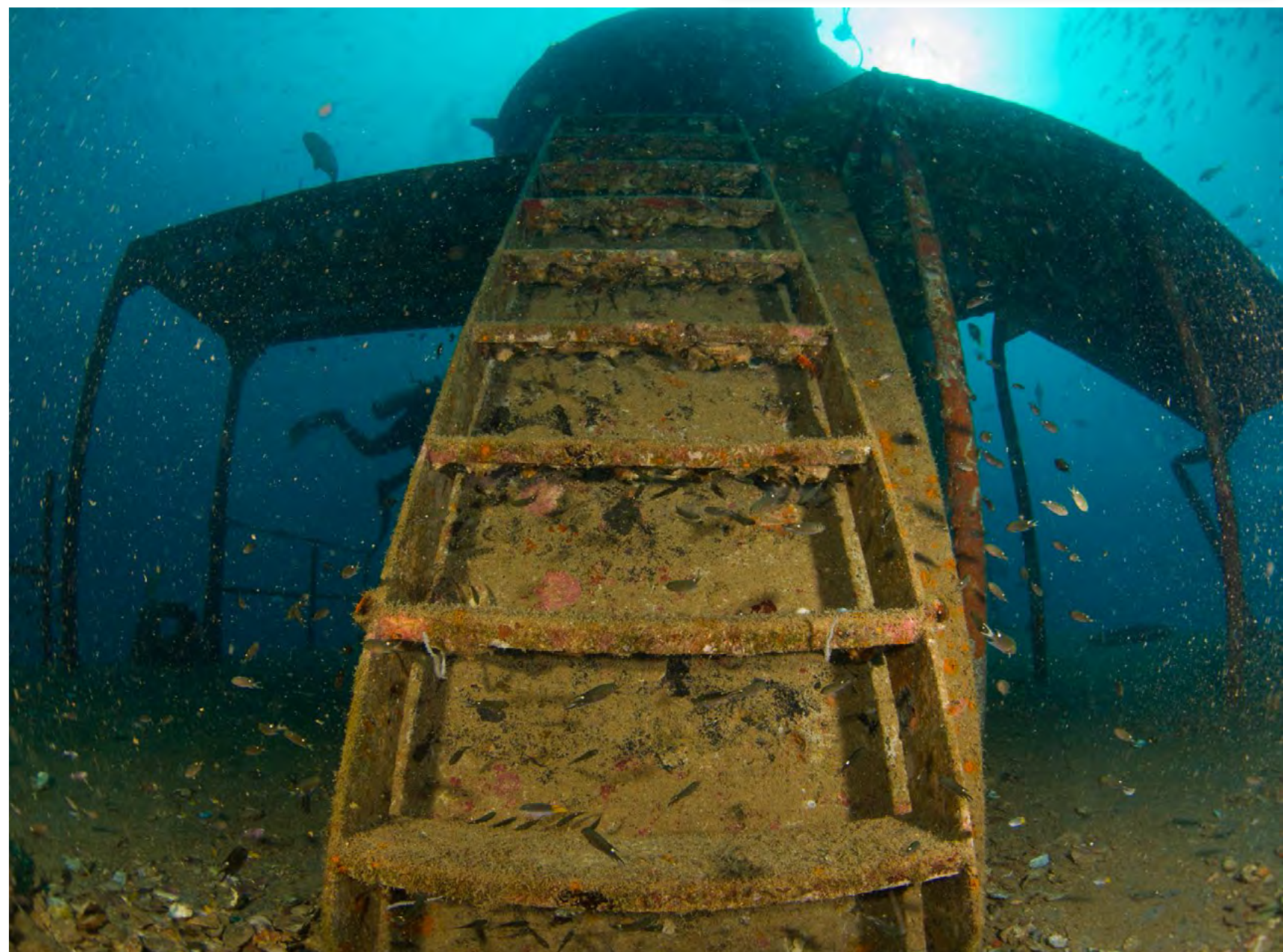
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Main stairway leading to the wheelhouse (above); Diver swims above the front canon (left); Diver emerging from the wreck's interior (top left); Sign reading 'WRECK DIVE ONLY' warns untrained divers (top right)



Hatches
with their
welding
breaking
away



tified students and experienced divers alike. The bow of the ship soon looms over you as you descend down towards the sea floor. Exploring the sides of the wreck you can peer in through the many portholes, allowing a peek into the inner compartments of the ship. Swimming the



length of the vessel you soon find yourself at the wreck's deepest point, at its stern where the rear

mounted cannon aims out off the back and into the blue. This is often the murkiest part of the dive

with occasional thick thermoclines lying between 25 and 30 meters.

Heading back along the main deck and up a set of stairs, the old lookout and wheelhouse appear in front of you, towering over the rest of the wreck where you can take in the same view of the wreck once shared by the ship's commander and officers.

All over the wreck there are various entry and exit points for trained wreck and technical divers, as well as students learning wreck diving techniques in relatively safe and relaxed surroundings. Due to the ship being cleaned and emptied, the inside of the wreck is home to large open chambers and

unobstructed passageways to explore the inner sections of the vessel. Some of the deeper areas

have been welded shut, minimizing risk to the overly curious diver. However, over time, some of these have rusted away or been removed to allow further exploration.

The wreck has certainly become the largest and most popular artificial reef in the waters surrounding the island. With the huge boost in tourism, local dive centres have benefited greatly by the addition of the wreck, as well as giving Open Water students a great excuse to stay on for a few more days once their course has finished!

It is a far cry from the cold iron works in Oregon 70 years ago, but the HTMS *Sattakut* now joins the thousands of other wrecks around the world in the oceans depths, showing that something with such destructive power can also form

the basis of new life, and promote the creation of coral reefs, providing a habitat for fish and other marine life in which to thrive. □

Nick Shallcross is a British underwater photographer based in the Gulf of Thailand. More of his work can be seen at www.nickshallcrossphotography.co.uk



Portholes on the old wheelhouse (above); Glassfish surround the rear mounted gun (left)

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EN.WIKIPEDIA.ORG/WIKI/LANDING_CRAFT_INFANTRY





WWI Russian submarine located by Estonian divers

Estonian divers have discovered what they believe to be one of Russia's first battle submarines. The *Akula* (or *Shark*, in English) was the first Russian submarine able to cruise long distances. In 1912, *Akula* made the world's first multi-torpedo volley with five torpedoes.

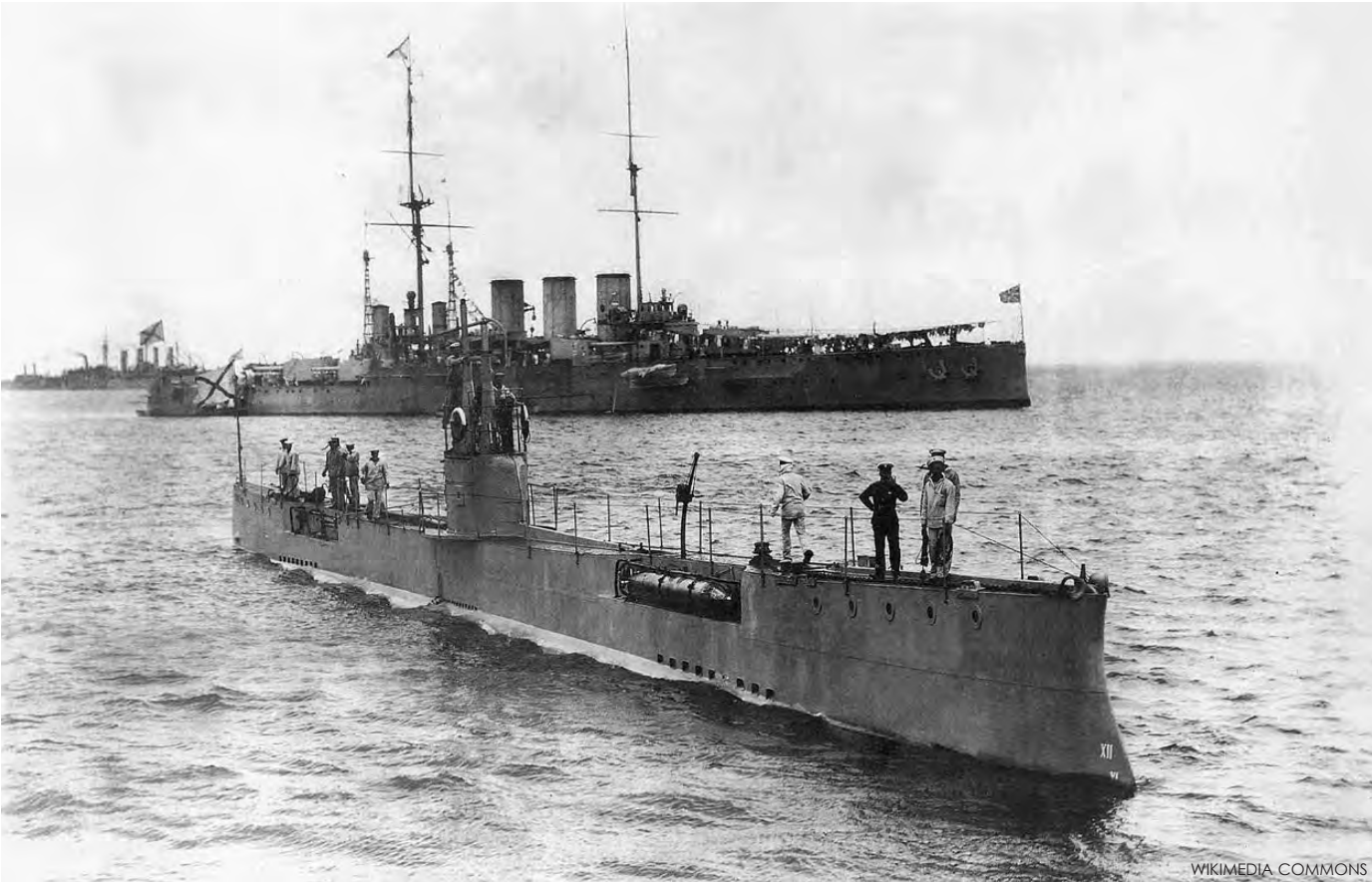
The 400-ton craft, commissioned in 1911, was the biggest in the pre-revolutionary fleet. During the First World War, she served in the Baltic Fleet making 16 patrols and unsuccessfully attacked the German coastal defense ship SMS *Beowulf*.

In November 1915 during her 17th patrol, she struck a mine and sank near Hiiumaa with the loss of all 35 seamen and came to rest at a depth of about 30 meters.

Last month a vessel matching the *Akula's* description was found at the bottom of the Baltic Sea by divers from the company Technical Diving Estonia, Delfi.ee reported.

Russian and Latvian divers then joined for a fresh expedition with the Estonian team after hearing the sub had a blown-off nose cone and three distinctive propellers.

"That made us think it could be the famous *Akula*, but we weren't sure until we made the dive," said diver Konstantin Bogdanov to the U.K. daily the *Telegraph* in a telephone interview. "Part of the outer shell of the craft at the stern was still intact and suddenly we could see, through the shells stuck to the hull, the word 'Akula' in white lettering." □



Imperial Russian submarine *Akula* (Russian for "shark") and armoured cruiser *Ryurik*, 1913



USS *Houston* off San Diego, California, in October 1935

Wreck confirmed to be WWII U.S. cruiser

Navy divers from the United States and Indonesia confirmed that a sunken vessel in the Java Sea is the World War II wreck of the USS *Houston*, sunk by the Japanese in 1942.

It serves as the final resting place for about 700 sailors and Marines. The ship carried 1,068 crewmen, but only 291 sailors and Marines survived both the attack and being prisoners of war.

Resting off the west coast of Java, Indonesia, the ship is a popular recreational dive site, U.S. Navy said.

In recent months, Navy archaeologists worked with Indonesian Navy divers to survey the wreck over the course of 19 underwater searches, U.S. Pacific Fleet commander Admiral Harry Harris said on Monday. The Navy History and Heritage Command confirmed that the recorded data is consistent with the identification of the former *Houston*.

Disturbances

Admiral Harry Harris added that divers have documented evidence the watery gravesite has been disturbed. Assessments conducted in June to determine the condition of the *Houston* found that hull rivets, a metal plate and unexploded ordnance were removed from the ship. There is also oil actively seeping from the hull.

Officials are working on measures to keep the site from further disturbance.

Following the battle of Java on 27 February 1942, USS cruisers *Perth* and *Houston* steamed into Banten Bay where the two ships came under attack from a Japanese battlefleet on

February 28.

During the battle that ensued, the *Houston* was struck repeatedly by torpedoes. Captain Albert Rooks was killed by a bursting shell at 00:30 and as the ship came to a stop. Japanese destroyers moved in, machine gunning the decks. A few minutes later, *Houston* rolled over and sank.

Houston's fate was not fully known by the world for almost nine months, and the full story of her last fight was not told until after the war was over and her survivors were liberated from the prison camps. □

SOURCE: DAILY MAIL ONLINE





On 11 September 1952, the C-45 was on a routine flight from Bedford, Massachusetts to Griffis Air Force Base near Rome, New York, when the left engine began failing about 40 miles southeast of Utica



Shipwreck hunters discover U.S.A.F. aircraft lost 62 years ago

USAF C-45 aircraft found in deep water in Lake Ontario off Oswego, New York, by shipwreck explorers.

The C-45 is almost totally intact. The fiberglass nose cone is missing as are the vertical stabilizers. One of the blades of the left propeller broke off and lies nearby on the bottom. Part of the windshield was broken and the left side of the body behind the wing has been

torn away.

The C-45, the military version of the Beech Model 18, remained relatively intact after plunging into the lake on 11 September 1952. The airplane was abandoned midflight after the left engine failed and all five aboard parachuted to safety. The C-45 traveled another 65 miles after all aboard evacuated before finally crashing into

Lake Ontario. Town residents saw a plane circling out over the lake just before it plunged into the water.

The current shipwreck team was quite surprised when the image of an aircraft appeared on their sonar display as it was well beyond the mile offshore as reported by the few eye witnesses to the crash. □

Treasure discovery on 1715 wreck off U.S. State of Florida



BWVI recovered a beautiful gold coin along with a number of silver coins and other shipwreck related artifacts

Blue Water Ventures International (BWVI) working off the U.S. coast at Ft Pierce, Florida, recovered a beautiful gold coin along with a number of silver coins and other shipwreck related artifacts.

The Douglas Beach Wreck is one of the richest Spanish galleon shipwreck sites off the coast of Florida and in the past has produced thousands of gold coins and tens of thousands of silver coins as well as significant amounts of gold jewelry and a wealth of artifact materials both of intrinsic and historical value.

Though a majority of its work is done in virgin territory on one of

the 1715 Fleet wrecks site, known as the Douglas Beach Wreck, BWVI's Captain John Brandon and the M/V *Endeavor* crew made the discovery during the exploration of an excavated area of the site.

Along with the coins were discovered broken pieces of Kang Hsi Chinese porcelain, shards of pottery, ships spikes, encrusted objects and scattered ballast stones—all significant archaeological indicators of potential future recoveries.

BWVI believes its recent discoveries may point the way to future significant discoveries in unexplored areas of the Douglas Beach Wreck site. □



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Now pack just half of the clothes and double the money.

TO ALL GATES

Text by Dan & Betty Orr

"By failing to prepare, you are preparing to fail." — Benjamin Franklin

We all dream of some day going to that special place somewhere around the globe for that 'dive of a lifetime'. In our imagination, we see the beautiful hotel, the splendid rooms, exotic foods and underwater scenery that truly takes your breath away. Whether your travel takes you to your dream destination or to your favorite local dive site, the key element to truly enjoying the trip is preparation.

Preparation must begin long before you arrive at your chosen

dive site and involves a number of components. These components include the trip as well as the diving. We will focus first on preparing for the trip to your dive location. Whether your travel takes you across town or across the globe, preparation will reduce frustration and inconvenience so that you can truly reap the benefits and rewards of the dive location.

"It's a dangerous business, Frodo, going out your door. You step onto the road, and if you don't keep your feet, there's no knowing where you might be swept off to." — Bilbo Baggins

Before you begin your journey with that very first step out of your front door, there are several things that you should first consider.

The first step: Make your lists

Any successful plan begins with a comprehensive list or, more appropriately, lists. Since your travel involves many facets, it may require more than one list. Besides the essential pre-dive checklist, which will be addressed in a separate article, these lists can include your itinerary, which is, in reality, a list of what you are doing, where you are going and when you are doing it, a clothing list, camera equipment (surface and underwater) list and, of course, a diving equipment list.

These lists are to make sure that you have not forgotten anything essential that would impact the full enjoyment of your travels and to make sure that you are bringing everything back with you at the end of your trip.

Know the laws. When making these lists, it is important that you know about and comply with any laws or regulations regarding

what you can and cannot bring into a region or country.

Medications. Make sure that any medications are in their original bottles/containers and that all prescription medications have the prescription information intact on the bottles. Any medications, prescription or not, that are suspect may be confiscated by the authorities upon entry into the country.

Camera equipment. There are countries that restrict the amount of camera equipment you may bring in with you. There are popular dive locations in countries that limit the traveler to no more than two cameras.

Clean your gear. Many countries around the world are concerned about travelers bringing in invasive species and may require any hiking, camping, fishing and diving equipment to be fully

cleaned and debris free upon entry. Carrying dirty or suspect equipment may result in confiscation, a fine or both.

It is the traveler's responsibility to comply with any and all laws and regulations.

Don't overpack. When preparing your lists, you may want to sit down with a pad of paper and go through your itinerary, thinking about what you would need each day and for each activity.

Be very careful, as you may have a tendency to overpack.

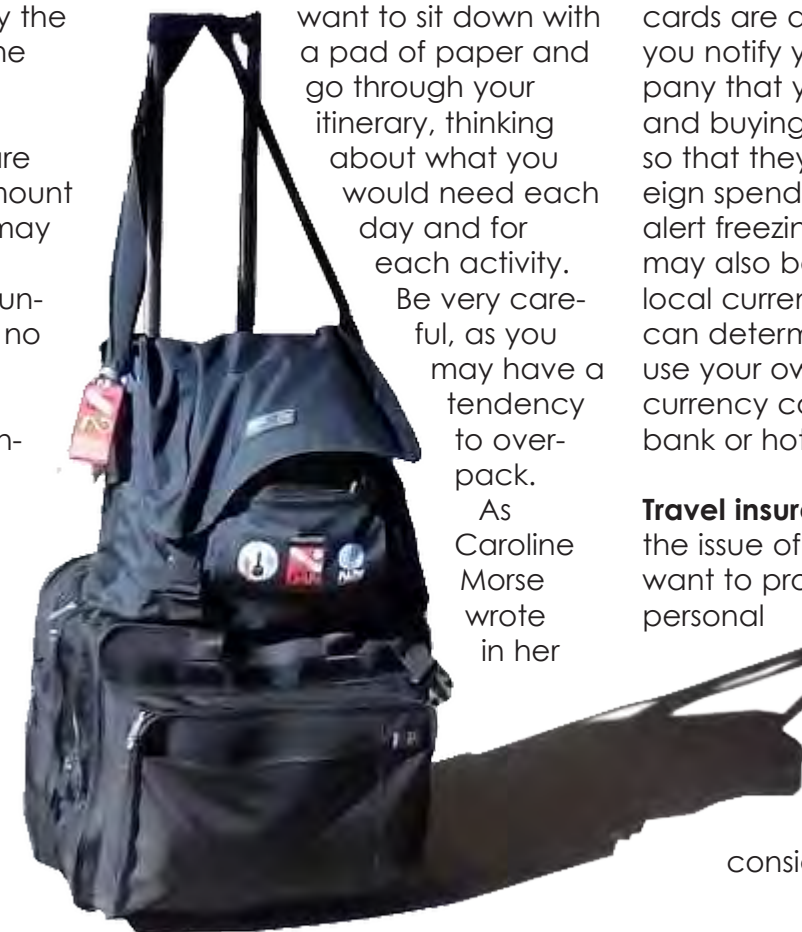
As Caroline Morse wrote in her

10 Cures for the Chronic Overpacker: "Lay out the clothing and cash you plan to bring on your trip. Now pack just half of the clothes and double the money."

Bring extra cash. And, speaking of money, it is always wise to bring extra money for contingencies including emergencies. Credit cards are a good thing as long as you notify your credit card company that you will be traveling and buying outside the country so that they don't misinterpret foreign spending and issue a fraud alert freezing your credit card. It may also be wise to carry some local currency to use until you can determine whether you can use your own cash or have your currency converted at the local bank or hotel.

Travel insurance. Before leaving the issue of finances, you may want to protect your personal finances by considering insurance.

To protect your investment in your 'trip of a lifetime', you may want to consider trip insurance to



Preparing Yourself for Dive Travel

Going to Europe or just passing through?

The **Schengen Area** is the area comprising 26 European countries that have abolished passport and any other types of border control at their common borders, also referred to as internal borders. It mostly functions as a single country for international travel purposes, with a common visa policy. That means that travelers arriving i.e. from the United States only have to go through immigration once when traveling to Europe.

The area is named after the Schengen Agreement. Not all EU member states have ratified the agreement. Most notably the United Kingdom has opted not to become a member. Meanwhile Iceland, Liechtenstein, Norway, and Switzerland who are not members of the European Union participate in the Schengen Area. □

cover trip cancellation or interruption.

Many credit cards have some level of insurance coverage if the trip is purchased using their card. However, this coverage may be limited, so it is incumbent upon the traveler to understand what coverage they have and how to access it.

Remember, when it comes to trip insurance, purchase it early (probably when you book your trip). To have coverage for trip cancellation due to storms such as hurricanes or typhoons, coverage must be purchased before a storm is named by the weather service. Once a storm is officially named, it is an event in progress and you can no longer purchase coverage for it.

Many credit cards have some level of insurance coverage if the trip is purchased using their card.

Health insurance. Having insurance coverage for health-related issues when you travel is also essential. You just never know when you are going to experience a medical issue when you travel.

The Center for Disease Control states that between 20 to 50 percent of all international travelers, an estimated ten million persons, develop traveler's diarrhea each year.

Although you may have complete coverage in your home country, your healthcare coverage may not extend to a foreign destination. Some trip insurance plans do provide some medical coverage it may be limited.

Be sure to check with your healthcare provider to understand the limits of

your coverage and be prepared to purchase insurance to make sure you are covered for medical issues while traveling.

Dive accident insurance. One other area of insurance to consider is diving accident insurance. Although recreational scuba diving is an inherently safe sport, accidents do occur and those that do may require specialized treatment in a hyperbaric chamber.

Although treatment facilities are spread around the globe, treatment for pressure-related diving emergencies (arterial gas embolism and decompression sickness) may require specialized medical evacuation.

The cost of medical evacuation and treatment can be staggering and financially devastating to the uninsured. Make sure that whatever specialized insurance coverage you choose, it covers the costs associated with medical evacuation to the nearest appropriate treatment facility as well as coverage for all necessary treatments.

Insurance is as necessary and essential for dive travel as your mask, fins and snorkel.

Dynamic lists

And, by the way, these lists are dynamic. As you continue your preparation, you may think of things to add to your lists or things to modify if your itinerary changes.

Save lists. It is also wise not to discard your lists after a trip. Using past lists, as a starting point for subsequent trips will

"Pill passport"

Schengen rules require travellers to apply to their doctor for a certificate, valid for 30 days, proving their right to carry certain drugs to other Schengen countries. In particular this applies to medications with narcotic effects. This certificate must be approved by the National Board of health.

Uncertainty reigns

There has always been a rule that the traveller should be able to prove that medicine in his/her luggage is for his/her own use. The problem is that the lists used by different countries do not comprise the same drugs.

However, research on practise in various Schengen countries, resulted in the information that i.e. France with her 60 million inhabitants issues fewer than 500 certificates per annum. This seems to indicate that the French authorities do not take the rules very seriously calling into question how much the rules are actually enforced among the European member states. □

save you some time and effort so you don't have to start from 'ground zero'. There may be some benefit of having a permanent list of 'basic essentials' that must be part of each trip regardless of the destination or duration.

With your lists in hand, you are now well on your way to having a successful and truly enjoyable trip.

In the next article, read about Step Two: Fitness to Dive.

Dan and Betty Orr are consultants with over 80 years of combined diving industry experience. They provide diving safety and emergency management consultation, product review and evaluation, product and services marketing and educational expertise.

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Don't overpack. When preparing your lists, you may want to sit down with a pad of paper and go through your itinerary, thinking about what you would need each day and for each activity





Edited by
Peter Symes



IMAGE: BARRY SHIVELY

Florida Panhandle launches shipwreck trail

Underwater trail showcases Florida shipwrecks and promotes Panhandle tourism. Many of the shipwrecks along the trail were sunk to become artificial reefs, and have become popular fishing and diving destinations in varying depths of water with countless varieties of sea life.

The Florida Panhandle Shipwreck Trail is highlighted by an interactive website that features underwater videos of each shipwreck, the locations of local dive shops and the current marine weather forecast.

To guide visitors along the trail, an official passport can be obtained from participating dive operators. The passport contains information about each of the shipwrecks, a dive log to record each stop and a place to validate the visit with an official sticker.

Twelve selected wrecks

The 12 shipwrecks were chosen by a consensus of local dive operators, based on popular demand, historical context and ecological diversity.

Off Pensacola, the veteran aircraft carrier *USS Oriskany* is the largest artificial reef in the world, and has become one of the most sought-after diving destinations. Nearby are the U.S. Navy dive tender *YDT-14*, and the oilfield supply vessel *Pete Tide II*. *San Pablo*, a freighter that hauled fruit

from Central America, was sunk in a secret military operation during World War II. In shallower water, a series of three coal barges offer a great location for divers to practice their skills and learn about marine life.

Off Destin, the tugboat *Miss Louise* is a perfect destination for novice and intermediate divers. Off Panama City, the oilfield supply vessel *Black Bart* is intact from the top down between 40 and 85 feet of water. Two navy tugboats, *USS Accokeek* and *USS Chippewa*, offer exciting dives to 100 feet. At another site, the FAMI Tugs, one tugboat is situated on top of the other.

This new underwater trail represents our latest effort to showcase a portion of Florida's vast collection of shipwrecks. Each location along the Florida Panhandle Shipwreck Trail offers an adventurous opportunity for heritage, recreational, and ecological tourism.

— Secretary of State
Ken Detzner

North Korea announces plans to open underwater resort

According to the *Pyongyang Times*, the city of Wonsan on the east coast of North Korea is to be developed into a tourist city.

North Korean leader Kim Jong-un is moving ahead with the idea of building an underwater hotel that would change North Korea into a top-notch tourist destination. The development is to comprise an underwater hotel, flower park, international meeting hall, exhibition and exposition hall and stadium.

The beach resort to be built at Wonsan, which is 200km from the North Korean capital Pyongyang, would cater to up to 100,000 visitors, according to a report quoted by News.com.au. Wonsan which according to Wikipedia is a popular tourist destination for foreigners and locals alike, is also the terminus of the Mangyongbong-92 ferry, the only direct connection between Japan and North Korea. The nearby Songdowon is a famous sea bathing destination in North Korea, said to have exceptionally clear water. □

A visit to the *USS Strength*, a World War II minesweeper that survived both a midget submarine attack and a kamikaze raid, includes making friends with the resident goliath grouper. Off Port St. Joe, the steamer *Vamar* was made famous as a support ship for Admiral Richard Byrd's 1928 Antarctic expedition before sinking under mysterious circumstances in 1942.

The trail

The Florida Panhandle Shipwreck Trail was funded in part through a grant agreement from the Florida Department of Environmental Protection, Florida Coastal Management Program, by a grant provided by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration. □

To learn more about the Florida Panhandle Shipwreck Trail, visit www.floridapanhandledive trail.com.



Car rental firms caught overcharging customers from wealthier countries

The European Commission has written to at least six car rental firms operating across Europe, urging them to stop the discriminatory practices of using online booking systems that 'automatically re-route' customers to other web pages resulting in customers not being able to access the lowest fares on offer.

The Commission says it is aware of one case where a customer from Germany was asked to pay

double the original price on offer when attempting to rent a car in the United Kingdom after entering his country of residence.

The Commission said it has received hundreds of complaints against the six companies—identified as Europcar, Hertz, Sixt, Enterprise, Goldcar and Avis—and wrote to the CEOs of the companies warning them that such practices run contrary to the notion of a single EU market. □



Airbus unveils prototype “smart” bag

Airbus has unveiled a prototype 'smart' bag featuring an RFID chip, allowing passengers to track luggage during their journey. The chip allows 'Bag2Go' to be recognized by automated airport and airline baggage systems that connect the bag with a passenger's specific flight itinerary.

Mobile technology and other location-based technologies such as GPS, can track the luggage along its journey. The bag's accompanying iPhone app's 'Find My Bag' feature allows passengers to check whether their bag has made it onto their flight and trace its location. □



Some airlines are phasing out touch screens on the back of airline seats as more travelers bring their own personal electronic devices for entertainment. Instead, some carriers are offering in-flight entertainment that travelers can stream directly onto their personal devices

Airlines poised to phase out seat-back screens

The screens are said to be heavy and costly, and instead of seat-back screens, some airlines will be offering in flight entertainment through a special server that's loaded with "hundreds of movies and TV shows that passengers can stream directly through their gadgets."

A new study by Osurv, titled "Airline Passengers Receptive to BYOD Future," reported that travelers prefer to bring their own devices on travel than to watch

in-flight entertainment on seat-back screens. While passengers prefer to bring their own devices anyway, they also want to be compensated for helping the airline cut back on costs such as more free entertainment or lower ticket prices.

Charging

The down-side to phasing out the seat-back screens, as expressed by one passenger featured in a CNN report, is that personal devices need to be charged,

especially if they're using wifi. Assuming your seat-back screen actually works, you're not responsible for keeping it powered up, which isn't the case for your iPad, cell phone, Kindle or whatever else you've brought with you.

Onboard outlets

This isn't a problem for passengers on planes that include outlets to plug in their stuff, but on planes that don't include charging stations, you're out of luck if your battery runs out of juice. □

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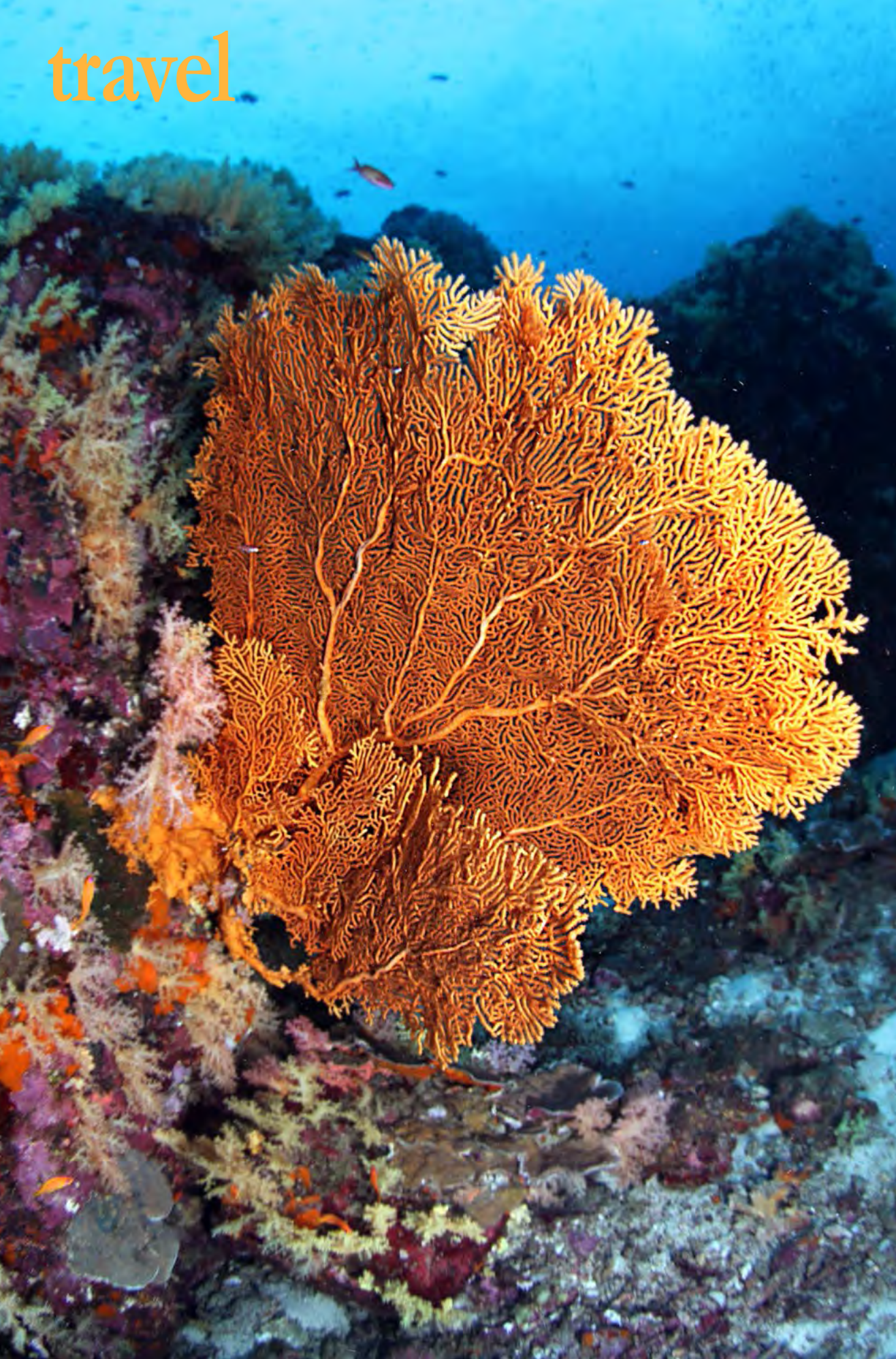
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Thailand's Khao Lak

Text by Kelly LaClaire
Photos by Kate Clark

Diving the Similan Islands





Gigantic orange fan coral on Koh Bon Pinnacle, Similan Islands National Park



Traditional longtail boat of Thailand (above). PREVIOUS PAGE: Harlequin shrimp on Richeleu Rock, Surin National Park

My dive buddy, Kate, is trying to get a shot of a purple sea fan but she's having trouble with her strobes and my ADD is kicking in. This happens occasionally. I try to be a good buddy, I really do, but there's just so damn much to see underwater and I get antsy if we stop too long for a photograph. This is horribly unfair I know, and I feel ashamed of myself at times, but I'm afraid we're going to miss something fantastic if we linger. I start whining to myself about the intricacies of Kate's insanely complex

camera because I'm absolutely positive there's 15 whale sharks and a half dozen great whites just around the next coral head... so hurry up already, Kate, and let's get moving! This is the conversation I'm having with myself when I feel something tickle the back of my neck. It's not physical—it's more like a soft breath against my brain, a whispering ghost of premonition. I look up and my eyes widen as my heart begins to pound involuntarily. My mind goes quiet and time seems to slow down.

*Glossodoris cincta nudibranch* on Boonsung wreck



CLOCKWISE FROM LEFT: Vendor at Bang Niang market; Local boy with elephant on beach in Taplamu; Rubber tree plantation in Khao Lak; Macaque monkeys in Khao Lak

Khao Lak

I wasn't even supposed to be in Thailand. Kate and I had just finished a two-week diving assignment in Indonesia and my flight back to the United States was already booked. My wife's birthday was only a few days away and I needed to get home. But, as sometimes happens, fate intervened.

Just before leaving, Joaquim Hedelin, a Swedish transplant and owner of Liquid Adventures, invited our team to tag along on a four-day liveaboard safari around the Similan Islands. Now you tell me, just how exactly does an avid diver say no to something like that?

So, that night I called my amazing wife and with her blessing ("You'd be silly to pass this

up!" she said. "We can celebrate my birthday when you get back.") I was flying with Kate to Thailand the next evening.

An hour-long taxi ride north of Phuket International Airport brought us to the bustling beachside village of Khao Lak. Since our boat didn't leave for two days, we had plenty of time to take a look around and soak up the culture. Thailand is unique and captivating—a mash-up of third and first world cultures.

Scooters and overfilled tuk tuks weave precariously among high-end SUVs and Mercedes sedans on the same highways. iPods and blue-ray discs sit incongruously next to fly-riddled pig skins and barbecued crickets at the same outdoor mar-

kets. It's a land of elephants and monkeys, jungles and temples, where the heat saps the life out of you and the natural beauty fills you up again.

But it's the people that truly make Thailand so endearing. Thai folk are friendly and warm, shy but curious. Invite them into conversation and they respond with polite affection and ready humor. Each and every local I met I liked immediately and they seemed genuinely interested in the happiness of others.

After the devastation of the tsunami that wiped out the entire village in 2004, I had fully prepared myself for locals still mired in the suffering and pain of so much dissolution. But what I found were people smiling and living their lives with resilience

and a seemingly unbreakable spirit.

Welcome aboard

It was to be my first trip on a liveaboard and I was feeling the anxious butterflies of anticipation. The boat crew, lithe men with quick movements, loaded our gear while the kitchen ladies welcomed us with friendly Thai greetings and broad smiles. After a quick tour of our new home, our group gathered on the foredeck for the departing ceremony.

Our captain and his family, who live on Liquid's 26-meter dive boat for six months a year, set out food and gift offerings to Buddha on the bow and then asked for safe travels. Fireworks concluded the prayers, frighten-





ing away any evil spirits that may have been trying to stow away, and soon we were slipping out into the black night towards the Similan Islands.

The next morning, our little group of seven gulped down steaming mugs of coffee before hurrying to the stern to gear up, some of us with toast still in our mouths. For several of the guests,

it was going to be the first dive in months and their excitement was infectious. One couple, who hadn't been in the water for a year, couldn't stop laughing while they raced to see who got ready the quickest.

Kate smiled at me while turning on my tank valve, "This is gonna be awesome."

Writer Kelly LaClaire in swim-through at Deep Six off Island Seven (left) and Donald Duck Bay at Island Eight (right) of the Similan Islands

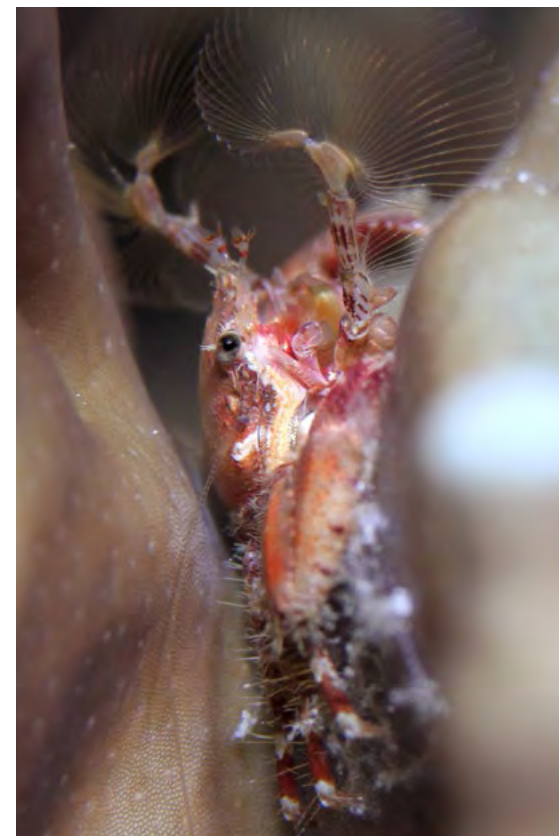
Similan Islands

The waters around the Similans are prolific and abounding. So much so, the Liquid crew aptly calls one dive site "Fish Soup," an area so packed with massing snapper and juvenile barracuda that you literally get lost in the twisting swarms of sea life.

Our first site, Christmas Point, was surrounded by vast granite monoliths that towered over the sand and coral floor. Several groups of imposing trevally passed us as we finned among the giant boulders, eyeing us suspiciously like sentinels on patrol while a school of large sweetlips tried to hide under a rocky overhang.



Khao Lak



Porcelain crab feeding, Koh Tachai Reef

Centuries of swift current and erosion have carved out numerous archways and long, cave-like swim throughs. Kate found one with a sizeable air pocket acting as a natural ceiling mirror and had me take a closer look while she readied her camera.

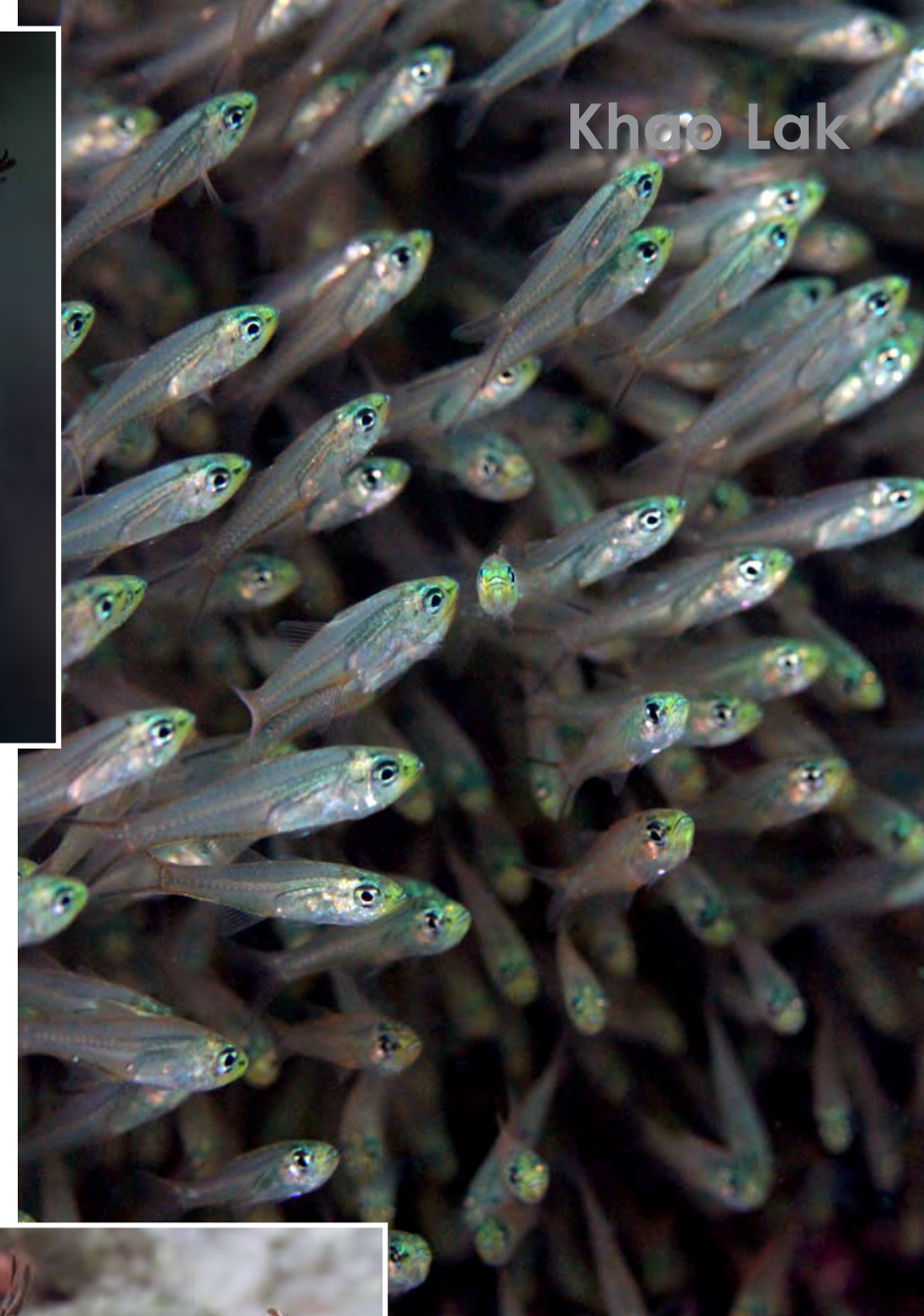
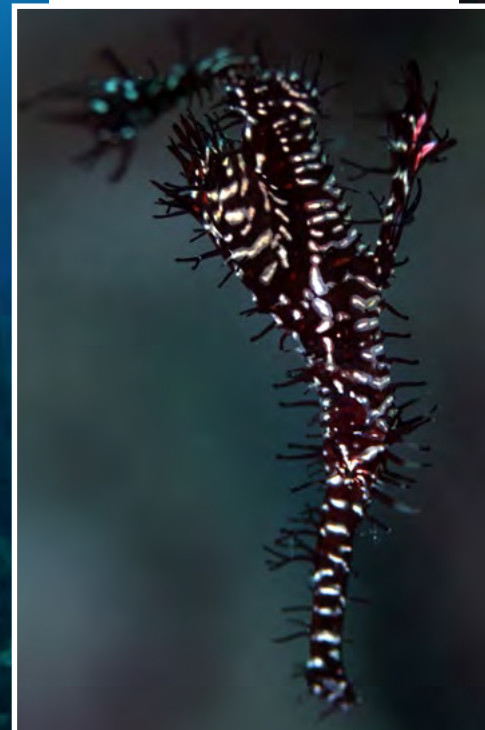
I marvel at Kate in these situations. All I have to do is swim where she directs me and smile on cue. She, on the other hand, has a much more arduous task. Capturing a magazine-quality underwater image isn't just difficult, it's damned near impossible. That may sound far-fetched, loyal reader, but let me assure you it isn't. Next time you're diving, try the following and see how you do:

While holding a 30-pound

camera, maintain perfect buoyancy even in swift current; direct your buddy with hand signals to get them into position and make sure the fish around you don't move; manually adjust your flash strobes into the correct position and check that they will fire with just enough light. Now, look through your leaky mask, through the tiny, foggy housing and focus your camera perfectly (remember if you get this step or any of these steps wrong, your picture will be worthless). Now, simply hold your breath so your bubbles don't get in the shot, conscientiously remembering to use only your fins to stay in exactly the same place without bumping into any coral around you and take the shot of a lifetime.



Squat shrimp at night, Koh Bon Reef



CLOCKWISE FROM LEFT: Diver over technicolor soft coral covering, Koh Bon Pinnacle, Similan Island National Park; Ornate ghost pipefish and glassfish on Richeleu Rock, Surin National Park; Juvenile rock mover wrasse, West of Eden, Island Seven, Similan Islands; Liquid liveaboard crew and guests with writer Kelly LaClaire and underwater photographer Kate Clark (sitting in the center)



Liveaboard lifestyle

Back on the boat, the galley crew had prepared breakfast: omelets, fresh pineapple, spiced pancakes and watermelon wedges. Our group attacked it, swapping stories about the last dive between sips of coffee and juice.

"What's next?" someone asked Joquim.

"Whatever you want," he replied smiling. "You're on holiday! Our next dive is scheduled in an hour and a half, but this is your vacation—make yourself at home and do as you please."

This sums up the liveaboard experience for me. And for the next few days, our group fell into a blissful fog of utter contentment—passing our time napping, reading, eating, diving and then starting the whole process all over again. In a word, it was perfect and I didn't want it to end.

Richelieu Rock

The Andaman Sea is famous for a fierce, bitterly cold current that rolls through it. Local divers call it the green monster on account of its unpredictable surges and pea soup

consistency.

As I followed Kate off the stern and dropped with the swift current into the horseshoe-shaped reef of Richelieu Rock, I could see the emerald colored thermocline below us, rushing around the giant limestone pinnacle like an angry underwater sandstorm.

The tides around Richelieu Rock are densely packed with plankton and other nutrients, creating incredible biodiversity, making Thailand's most coveted dive site the perfect



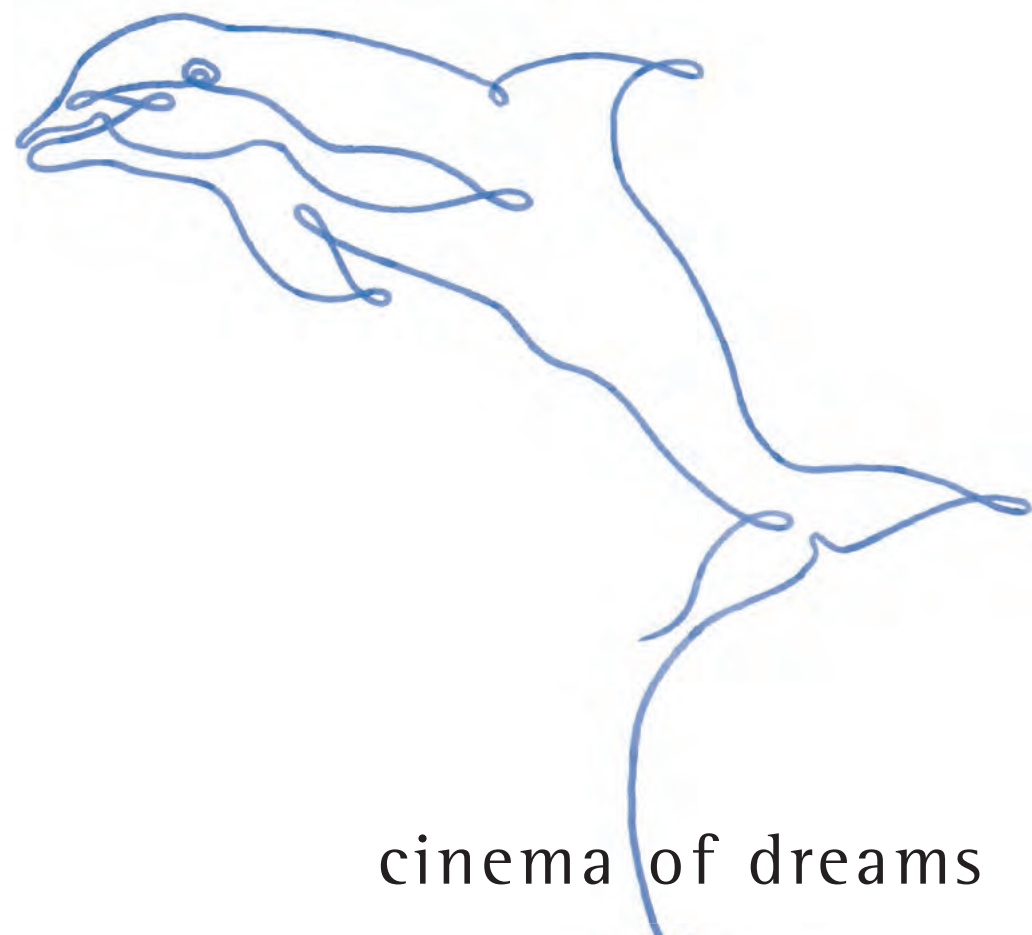
place to see not only large pelagics but the smallest macro treats as well. And if you're a photographer, probably your biggest challenge will be deciding which lens to use on each dive; chose the wrong one and a brief

encounter with the occasional whale shark or a timid eagle ray can leave you slightly frustrated.

Kate had her macro lens on for this dive as one of guides had given us a map to a special rarity nesting at this site. We descended down into the frigid green monster and I immediately began cursing my decision to forgo a wetsuit. I gave Kate our "Holy mother of God—it's frickin' cold, so let's hurry this up!" hand signal and we fought the current toward a small collection of boulders.



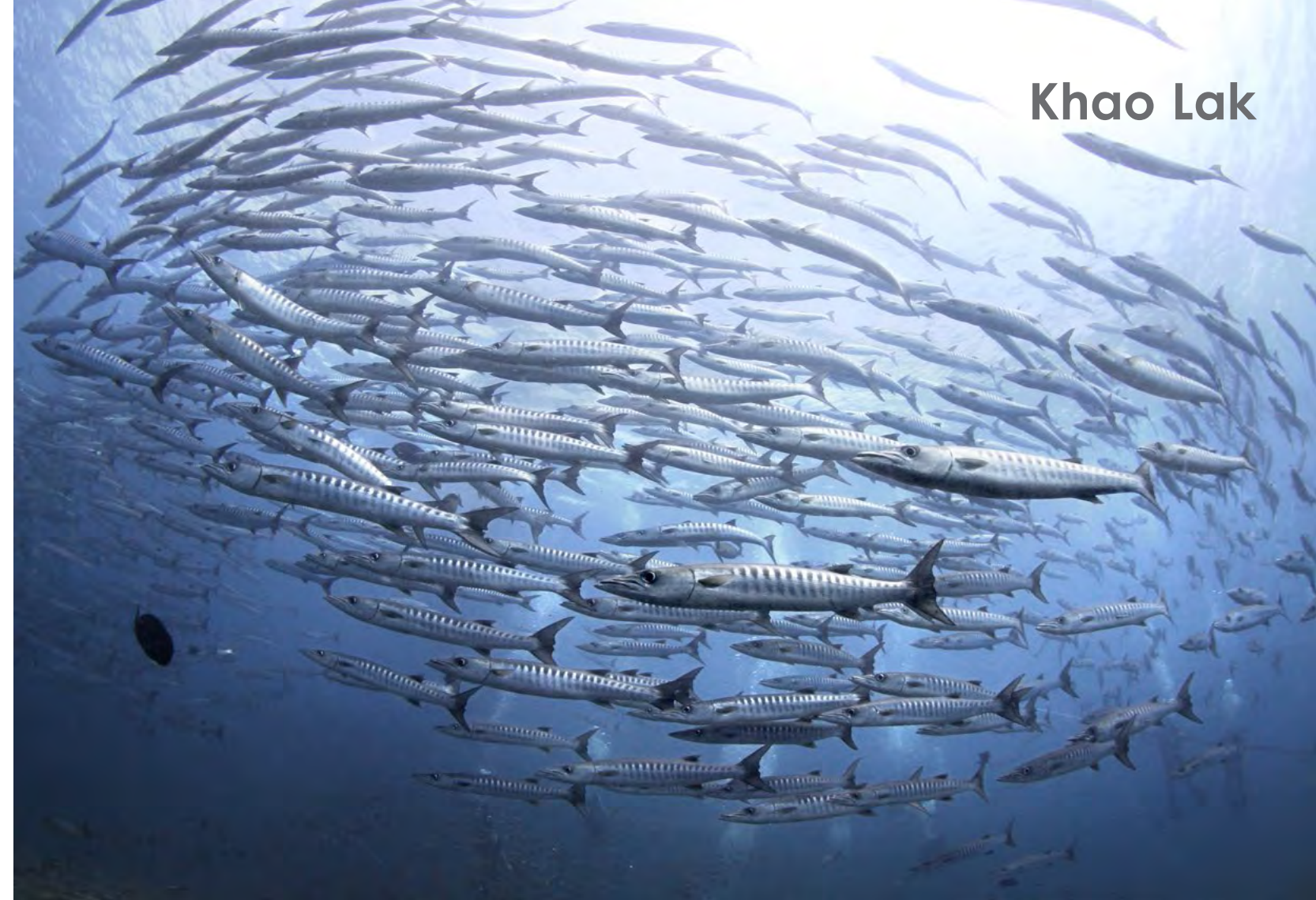
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Khao Lak



Tornado of blacktail barracuda, Koh Tachai Dome, Surin National Park; Reef cuttlefish (left) on Koh Bon Reef, Similan Islands

this particular species before, and in a moment, I had forgotten all about my trembling arms.

Harlequin shrimp seem to glow underwater as if they are constantly backlit by some hidden light source radiating inside their tiny little bodies. We watched them feeding for several

minutes before Kate wrapped her arms around herself and shivered—Bbbrrrrrr!

I nodded and we slowly finned upwards into warmer water, greeted by a cautious and hesitant cuttlefish. He flashed a multitude of

changing color patterns, extending his middle two tentacles at me. "You see this?" he seemed to say, "This gesture means the same below water as it does on the surface, big guy. So why don't you go back where you came from and leave me alone."

I wasn't too offended, I was intruding after all, and a quick look at my computer told me that my air was—shocker—running low anyway. So, we gave the guarded cephalopod an apologetic wave and headed up to our safety stop.

The Dome of Awesomeness

The single greatest day of diving in my life was spent at the island of Koh Tachai. Kate and I met on the top deck early to share a cup of

The viz gets sketchy in that tidal wave of freezing green water, but somehow Kate managed to find the right spot and we were soon watching two striking harlequin shrimp feeding on the broken leg of a blue starfish. I had never seen





Great manta ray (left) off Koh Tachai Dome, Surin National Park; Koh Bon Island (right) off the West Ridge, is a famous spot for diving with mantas

The group was buzzing as we slipped into our gear. A quick check among the guests revealed that most all of us had yet to see a manta in the wild and the prospect had each and every one of us nearly shaking with anticipation.

We weren't three meters down the mooring line when a massive school of barracuda swam by us in a lazy, twisting cyclone. They were followed by a group of batfish and a leery pack of trevally.

The dive site came more into focus as we dropped and I could see a giant granite dome at the center of the site surrounded by coral heads and rocky outcroppings scattered along the sea bed. We leveled off at around 20 meters and were greeted by a large green moray hissing at a banded sea snake who was hunting too close the grumpy eel's den.

Thousands of fusiliers swarmed the site and I was astounded at the amount of life making this island reef their home. There was so much activity and so many species to see my attention was being pulled in a hundred different directions at once. I turned to Kate and gave her a large "Are you kidding me?!" smile. She nodded furiously in agreement.

A curious hawksbill turtle glided by and we followed it for a few meters to a giant purple sea fan. It was here that Kate stopped for a photograph and my lack of attention span began to get the best of me. So far, this dive site had been amazing and the thought of missing anything was almost too much for me. Then the giant manta

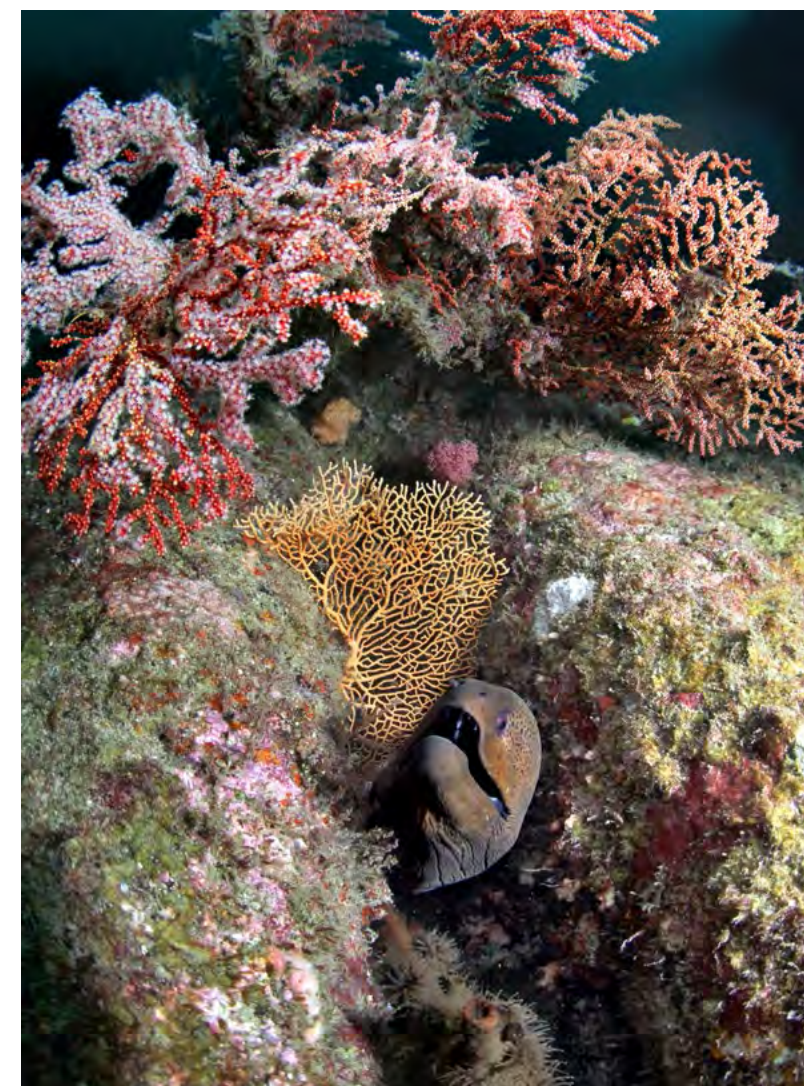


ray passed overhead and nothing else seemed to matter.

It was easily 15 feet from tip to tip, as big and alien as a flying saucer. The massive underbelly flashed gray and white while long, delicate gills rippled from its own wake. I was instantly mesmerized and my regulator almost fell out of my mouth, but somehow I managed to give Kate three soft taps on the shoulder.

Kate let out a shriek of surprise and shot off to get along side it, sea fan and buddy forgotten in her excitement. I generally don't have too much trouble keeping up with her but this was different; she was gone in an instant and I was swimming as hard as I could just to keep her fins and the shadow of the giant ray in my sights. Thankfully, after only a minute, Kate came to a stop and the manta turned on its side, wings displayed in a vast, far reaching triangle, and swooped back towards us.

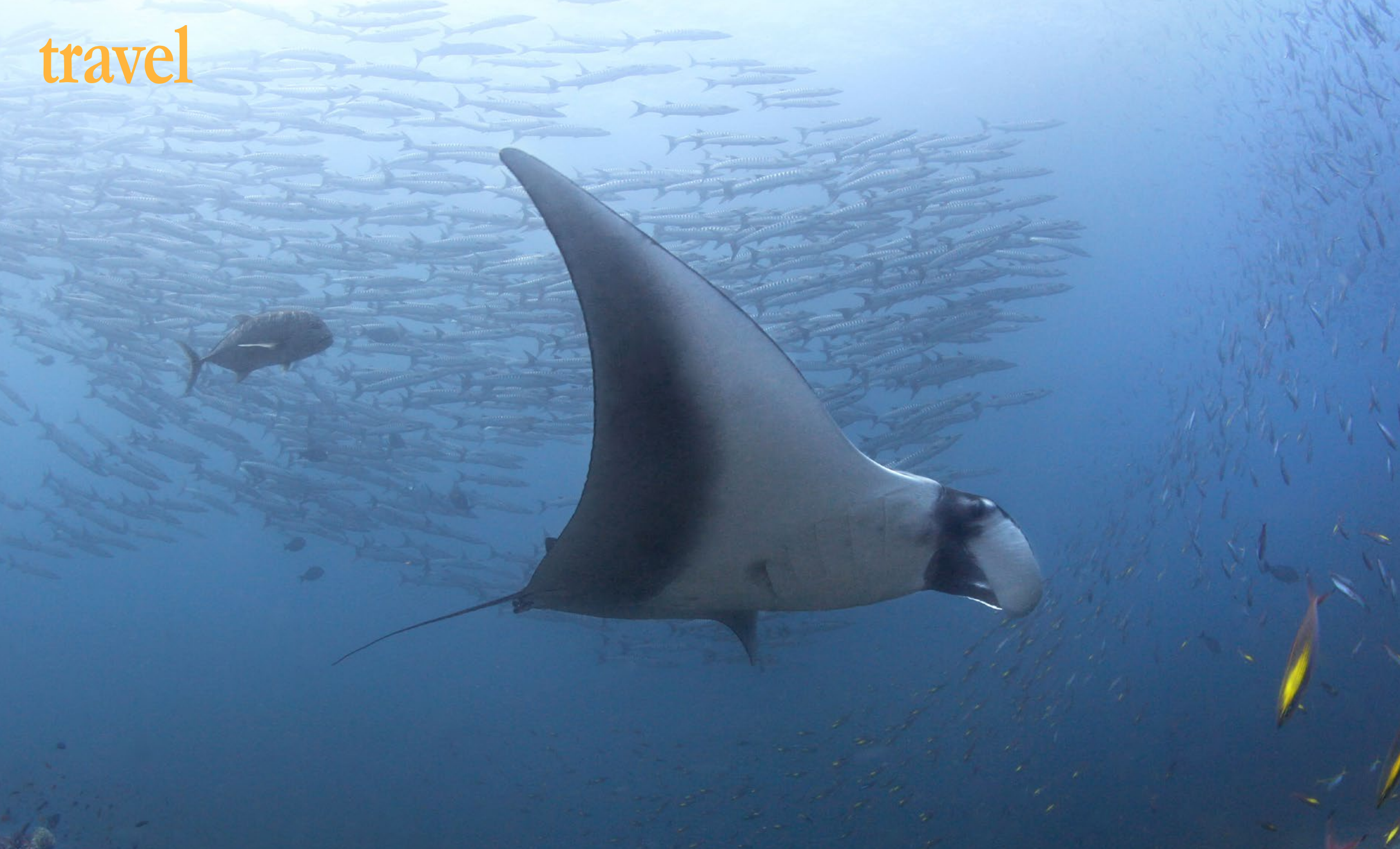
By now the whole group had seen it and they swiftly gathered in a loose semi circle to marvel at its elegance. Our guides had their hands held out, asking us to stay put lest we spook the gentle giant and chase it away. As it



Giant moray eel and corals, Koh Tachai Dome

tea and watch the sunrise before joining our friends for a light breakfast and morning briefing. The currents could be fast here, we were told, and as such, lots of nutrients swirl around this dive site, attracting all kinds of life, including

manta rays. We were told that the last few groups had not seen any of the giant rays, and they might be gone for the year, but if we did have a chance at spotting them, this was going to be the place.



banked around us a second time, the manta gracefully fluttered its enormous wings and passed within touching distance of Kate and me.

The manta danced around us, swimming in wide dignified circles for the next few minutes while our wide-eyed group watched in delight. When my gauge reached 200 psi I knew I could wait no longer—I had to get to 15 feet or face the consequences. As I sat at my safety stop, holding onto the mooring line, I watched in envy as Kate joined the few

of our group who still had plenty of air.

At the surface I saw the captain on the upper deck, smiling and holding out his arms like an airplane. “Manta!” he laughed. “Manta, manta, manta-aaaaa!”

Take two

For the next hour and a half, we eyed our dive computers like school kids waiting for the summer bell to ring. Everyone in our group was itching to get back in the water. Another boat in the area had

spotted the manta again and the surface interval couldn’t end fast enough.

As soon as the first computer squawked, we stepped off stern and sank down along the mooring line, and again, I was shocked at the multitudes of life. Thousands of Randall’s fusiliers darted around the smooth granite boulders chasing swarms of powder blue surgeonfish in a dizzying game of tag among the corals.

We heard a frantic rattle from a guide’s noisemaker and turned to see

the manta swooping in for another look, this time followed by a second giant ray, slightly smaller but every bit as breathtaking.

There is something ethereal about manta rays that pull you towards them, some inexplicable quality that cannot be defined. Perhaps it’s their delightful gentleness or their prodigious size that does it; perhaps it’s the sheer extraterrestrial quality of them. But whatever it is, they possess a sort of magnetic force that keeps your fascination piqued and

THAILAND TRAVEL TIPS

Thailand is a wonderful country, but the East is much different from the West, and if you’re from the United States, Canada or Europe, you may want to keep the following in mind before you go:

Say no to plastic! – Most Asian countries love plastic, and Thailand is no exception. Anything you buy—a pack of gum, a candy bar, a single bottle of water, anything—will most likely be handed to you in a plastic bag. Please tell the person behind the counter you do not need it. The roadsides, beaches and oceans have enough plastic polluting them already; try your best not to add to it.

Tipping – Tipping your dive guide or an ex-pat waiter or waitress is totally acceptable in Thailand. However, if you stop by a roadside food cart (and I highly recommend you do, some of the best food to be found is from these local carts) tipping can be offensive. Local Thai people believe in helping others for the joy of it and handing them a couple bills for their service can be confusing and slightly distasteful for them. If you unsure what the protocol is in a specific establishment, don’t tip and you will be safe.

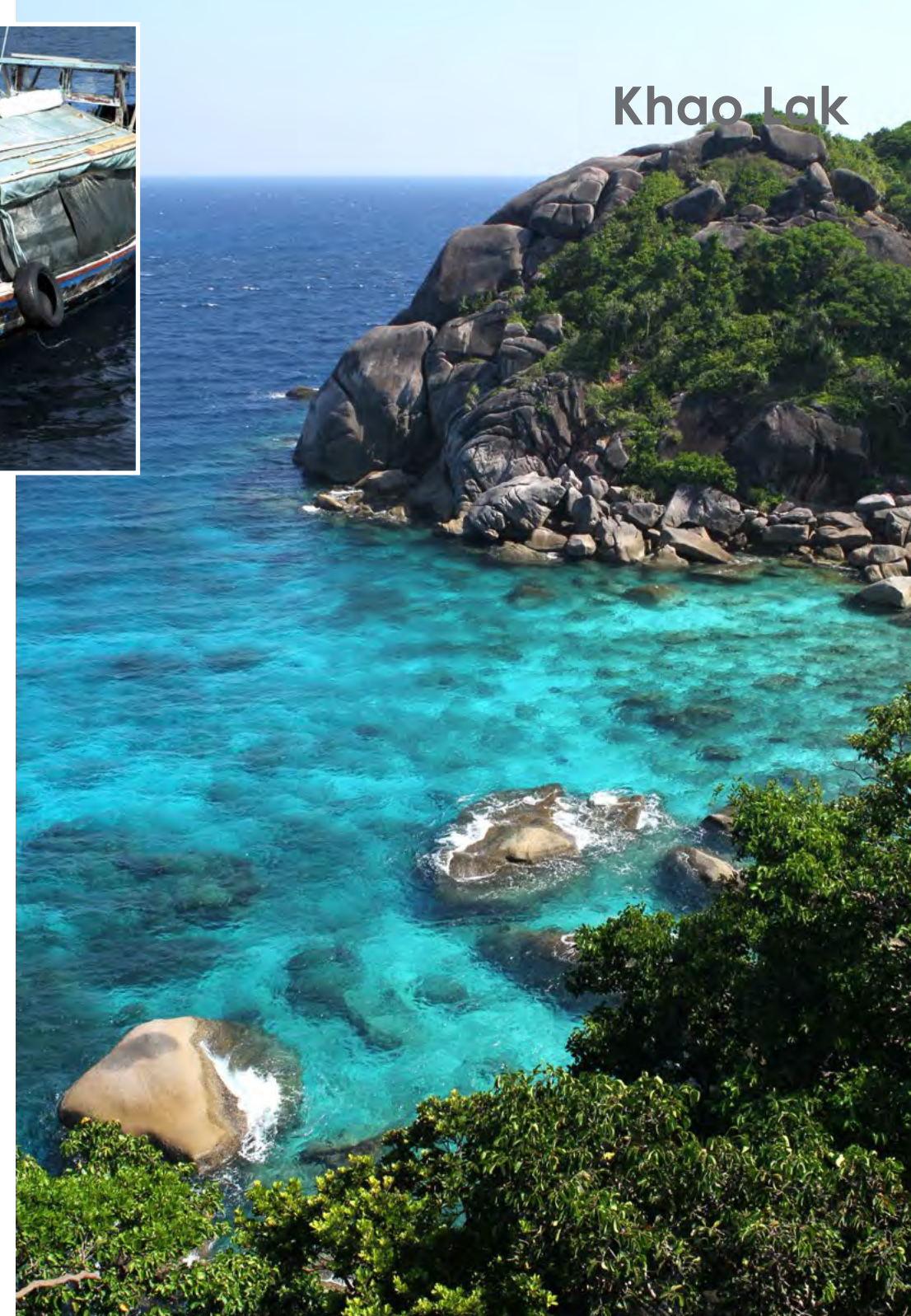
Bring hand sanitizer – Sanitation rules in Thailand are not the same as you may be used to. Many public bathrooms do not have sinks and a few restaurants won’t either. It’s not something to worry about, just bring a couple travel-sized bottles of hand sanitizer for you and the kids and you’ll be fine.

Bring toilet paper! – I don’t think this needs too much explanation; just please believe me and remember to put a few extra rolls in your suitcase. Make sure you keep some with you wherever you go.

Bring an anti-diarrheal medication – Again, this is probably self-explanatory and possibly self-evident, but Western stomachs are not always well adapted for Eastern cuisine and their preparations. □



PREVIOUS PAGE: View from bow of Liquid liveaboard. THIS PAGE: Liveaboards in the morning light just off Koh Bon Island, Similan Island National Park; The clear turquoise waters of Island Eight, Similan Islands (right); Local boat villager (above) and swing on Koh Tachai Beach (bottom left) in Surin National Park



we never seemed to tire of it.

They circled us for the next hour, swimming in great sweeping double helix patterns. Every diver in our group remained almost motionless, watching with awe as the slight current swept us around the granite monolith at the center of Koh Tachai. My tank lasted 80 minutes, although I had to suck my tank dry to do it, and for the first time Kate and I ended our dive simultaneously.

I know, as a “responsible diver” I’m not supposed to tell you that. I’m supposed to tell you that at 750 psi I slowly headed up towards the surface for a safety stop, but that isn’t what happened at all. I was completely enthralled by what I was seeing and the thought of getting out of the water any earlier than I absolutely had to was unthinkable.

By the time we surfaced, the needle of my air gauge was deep into the red (almost touching the pin, in fact) and as we passed our fins to the boat boy, he looked at it reproachfully, shaking his head. “Every time with the mantas,” he said under his breath. “Every time.”

Farewell

I knew I was going to enjoy the liveaboard experience; that was plainly obvious. I mean, seriously, what could be more satisfying than being on a beautiful boat (and Liquid’s boat is beautiful) and diving four or five times a day in pristine waters? What I wasn’t prepared for is just how much I would love it. I am not exaggerating when I tell you that spending a dive holiday on a liveaboard is just about the most insanely fan-

tastic thing anyone could do.

Guests are pampered from the moment they wake up to the moment their head hits the pillow. All the diving you can stand, all the tasty food you could eat, all the sunshine and beauty your body can absorb, combined with the absolute absence of everyday distractions. Every minute you spend out at sea and exploring the underwater environment acts as a soothing salve to the countless scrapes and bruises that day-to-day living inflicts upon you.

When you leave, you’ll feel both exhausted and invigorated at the same time and, like any goodbye, stepping off that ship won’t be easy. It will call to you again and again, when you’re at your desk, when you’re sitting in traffic, when you’re sleeping and dreaming your heavenly scuba

dreams, because liveaboards get in your blood like some strange addictive chemical—and once you’re hooked, you’re hooked.

So, if you’re planning on treating yourself to a diving vacation in the near future—and you should be planning one, you work hard after all and you deserve it—let me highly recommend several blissful and relaxing days diving

from a liveaboard. I promise you won’t regret it. □

Travel writer Kelly LaClaire and underwater photographer Kate Clark are cousins based in Portland, Oregon. They travel as a team because Kelly is afraid of spiders and needs Kate to kill them for him if one gets into his hotel room.



LIVEABOARD TIPS

If you have never been on a live-aboard before, here is a short list of helpful hints to consider:

Don't dive if you don't want to – This is the first rule of liveaboard trips. Diving is tiring and can wear you out. Diving four or five times a day can be downright exhausting and it is totally alright if you need to skip a dive or two, especially on the last couple days of the trip. You are on vacation after all, so if don't feel like diving and you would rather sit on the sun deck and read, by all means do so. No one will think less of you.

BYOC – That stands for Bring Your Own Coffee. In many Asian countries (and some other countries as well) instant coffee is all you will find. Therefore, if you like a nice quality cup of coffee in the morning, then remember to bring a couple pounds of your own favorite grind with you. Also, you may have to bring a small press or pour-over cup as some live-

aboards won't have actually coffee pots on hand. Ask your operator.

Take care of your ears – Diving 20 or 30 times in the span of four or five days is almost guaranteed to give you an ear infection if you're not very careful. To avoid this, ask your doctor about a prescription of Otic Domeboro Solution. It is a tad costly, but well worth it—having to stop diving for a day or two can be a real downer! There are over-the-counter solutions as well but the above has been proven to be the most effective.

Take electrolytes – Electrolyte packets can be purchased in almost any drugstore and are made to dissolve in a glass of water. You will be near the Equator and Thailand is both hot and humid, meaning you will be sweating and losing a lot of water and salt. Taking one or two packets a day with plenty of water will help keep your energy up and may assist in keeping your intestines happy.

Dietary needs – Although the boat will have plenty of amazing food and drinks, it may not have specific foods you may need or want. Usually, liveaboard operators are happy to store specific drinks or special foods for you if they can. So if you are vegan or vegetarian or diabetic, just ask the operator before you book your trip and they will do their best to accommodate you.

Bring a dive net – This isn't a must, but I would ask you to consider it. Small mesh bags can be purchased for very little money (or the boat may have their own) that can be attached to your BCD and used to store trash while you are diving. Unfortunately, on nearly every dive you take, a piece of discarded plastic or trash will be found somewhere around the dive site. Taking a mesh bag will allow you to pick up what you find and bring it back topside for proper disposal. The oceans need good stewards and divers should strive to be those people. □

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The 3D anatomical design, with pre-bent arms and legs with stretch panels and gender specific construction ensures a comfortable fit and a relaxing body position in the water. 3D-moulded real rubber kneepads are perfect for the diving instructor who spends a lot of time on his/her knees in the water while teaching.

Double smooth-skin seals at arms and legs, adjustable neck and a 10mm spinepad, with an extra seal at the backzipper work together to keep the cold water out. Seals are designed to fit WP boots and gloves.

All zippers in top class Vislon from YKK. The Bronze slider in the back zipper ensures trouble-free function for many years. ToughTex panels at elbows and knees, Bonded HiQ Nylon Thread and 100% CR Neoprene in all panels - quality in every detail.

The W4 also features double computer strap anchors with anti slip, comfort front neck zipper, inner plush lining, seat and shoulder antislip reinforcement.



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WWW.SSSNETWORK.COM

fact file

Khao Lak, Thailand



History In the mid-14th century, a unified Thai kingdom was established. It was known as Siam until 1939. Out of all the Southeast Asian countries, Thailand is the only one that has never been taken over by a European nation. In 1932, a peaceful revolution led to the establishment of a constitutional monarchy. Thailand was allied with Japan during World War II. But in 1954, it became a U.S. treaty ally. Thailand sent troops to Korea and fought alongside Americans in Vietnam. In 2006, a military coup resulted in the overthrow of Prime Minister Thaksin Ch-

innawat. Since then, turmoil in the government between pro- and anti-Thaksin parties has wreaked havoc in the governing of the country, which was further tested by historic flooding in 2011. In addition, thousands of people were killed and wounded in separatist uprisings in the southern ethnic Malay-Muslim provinces in 2004. These challenges have hampered the plans of constitutional reform of the current government led by the Puea Thai party. Government: constitutional monarchy. Capital: Bangkok

Geography Thailand is located in Southeastern Asia. It borders the Andaman Sea and the Gulf of Thailand, southeast of Myanmar. Thailand is in control of the only land route from Asia to Malaysia and Singapore. Terrain consists of a central plain, the Khorat Plateau in the east and mountainous areas. Coastline: 3,219km. Lowest point: Gulf of Thailand at 0m. Highest point: Doi Inthanon at 2,576m.

Climate Thailand is tropical with a warm, rainy, cloudy southwest monsoon from mid-May to September and a dry, cool north-

east monsoon from November to mid-March. The southern isthmus is always hot and humid. Water temperature is 28-30°C. Natural hazards include droughts and subsidence of land in the Bangkok area due to depletion of the water table.

Environment Thailand suffers from air pollution due to vehicle emissions, water pollution due to organic and factory wastes, deforestation and soil erosion, as well as illegal hunting, which is threatening wildlife populations.

Economy Thailand has a well-developed infrastructure and an economy of free-enterprise, with pro-investment policies and strong export industries. It has enjoyed solid growth since 2000 after recovering from the Asian financial crisis of 1997-98. Thai exports, which consist primarily of machinery and electronic components,



RIGHT: Global map with location of Khao Lak
BELOW: Location of Khao Lak on Thailand map



agricultural commodities and jewelry, make up half the GDP. However, the country felt the effects of the global financial crisis of 2008-09, which severely cut Thailand's exports. Since then, the economy has contracted and expanded, until the historic flooding of Bangkok in 2011 crippled the industrial and manufacturing sector. However, recovery is expected with modest growth in 2012.

Population 67,091,089 (July 2012 est.) Ethnic groups: Thai 75%, Chinese 14%, other groups 11%. Religions: Buddhist (official) 94.6%, Muslim 4.6%, Christian 0.7%, other religions 0.1% (2000 census). Living with HIV/AIDS: 530,000 (2009 est.) Internet users: 17.483 million (2009)

Currency Thai Baht (THB). Credit cards are widely accepted in hotels and dive centres but incur a 3% charge. Exchange rates: 1USD=31.90THB; 1EUR=42.49THB; 1GBP=53.02THB; 1AUD=29.70THB; 1SGD=25.58THB

Language Thai, English (secondary language for upper class), ethnic and regional dialects

Visa Passports must be valid for at least six months upon entry. A 30-day visa exemption will be issued upon arrival for holders of Australian, U.S., European and New Zealand passports.

Health There is a high degree of risk for food or waterborne diseases such as bacterial diarrhea; vectorborne diseases such as dengue fever, Japanese encephalitis, and malaria; animal contact disease such as rabies; water contact disease such as leptospirosis. H5N1 avian influenza has occurred in this country but poses a small risk to tourists, those who have close contact with birds (2009)

Decompression Chambers

SSS NETWORK / Phuket
Hyperbaric Services of Thailand
44/1 Moo 5, Chalmrprakiat Ror 9
Vichit, Muang, Phuket 83000
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24-Hour Emergency Phuket Mobile
Number: +66 (0)81 081 9000

Websites

Tourism Authority Thailand
www.tourismthailand.org



Grasshopper snacks for sale at Bang Niang Night Market



Diver with bluespotted stingray, Boonsung wreck

Papua New Guinea's

Kimbe Bay

Text and photos by Don Silcock

The Coral Crucible





Kimbe Bay

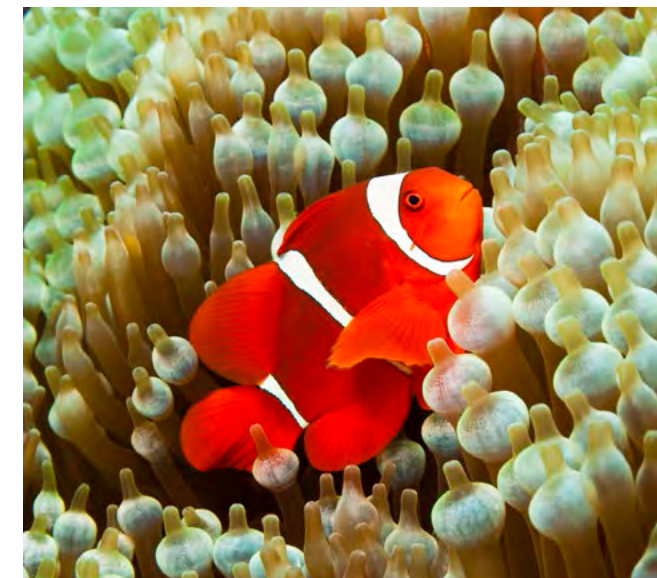
Superb sponges bask in the sunlight at Otto's Reef (left); Split shot of Restorf Island (above). PREVIOUS PAGE: Christine's Reef, Kimbe Bay

There is a line of thought in the scientific community that this is where it all began and the first corals originated... a large sheltered bay, roughly one third along the north coast of the island now called New Britain. The bay is called Kimbe and the country is Papua New Guinea—the wild and exciting nation crafted together in colonial times from the eastern half of the huge island of New Guinea and a string of other islands stretching out in to the Bismarck and Solomon Seas.

There can be no doubt regarding the profound fecundity of Kimbe Bay because the numbers, as they say, cannot lie and surveys by some of the best known names in marine biology, such as Professor Charles Veron and Dr Jerry Allen, and respected organizations like The Nature Conservancy, have helped to establish a bewildering array of statistics for the area.

Depending on which survey results are used, Kimbe Bay is host to around 860 species of reef fish, 400 species of coral and at least 10 species of whales and dolphins. To put that in a global perspective—in an area roughly the same size as California, Papua New Guinea is home to almost five percent of the world's marine biodiversity. Just under half of that fish fauna, and virtually all of the coral species can be

found in Kimbe Bay, which means that the bay can be considered as a kind of fully stocked marine biological storehouse.



Anemonefish at Susan's Reef



Location, location, location

New Britain is part of the Bismarck Archipelago, which forms the southern ridge of the so-called Ring of Fire—the volatile and unpredictable, horseshoe shaped, seismic strip of oceanic trenches and volcanic arcs that wreak periodic havoc and destruction

around the Pacific Ocean basin. The islands of the archipelago were formed some eight to ten million years ago as a result of what geologists refer rather mildly to as *volcanic uplift*. The flight from Port Moresby into Hoskins Airport on the southern edge of Kimbe Bay will put the whole uplift

concept into a slightly more dramatic perspective.

As you cross the narrow Vitiaz Strait from the main island of New Guinea, you will catch your first glimpse of New Britain, and you will see the western tip of a narrow crescent-shaped island roughly 500km long, by about 30km wide at its narrowest point and 150km at its widest. Running along the spine of the island are huge mountain ranges, created by those volcanic uplifts, which are so high they effectively isolate the north coast from the south and create their own weather patterns, so that while the north coast follows the normal monsoonal seasons the south is completely opposite. The mountains also create a partial rain shadow over the north, making the south coast the second wettest place on earth, with annual rainfalls of between six and eight meters.

The approach into Hoskins Airport takes you over the Willau-



Bathymetric map of Kimbe Bay

Sunrise over the volcanoes of Kimbe Bay (left); Topographical map of Kimbe Bay (right); Aerial view of Kimbe Bay Islands (bottom right)

mez Peninsular, the western boundary of Kimbe Bay, and provides a spectacular introduction to the other visually defining feature of this part of New Britain—volcanoes. On the tip of the peninsular are two large freshwater lakes occupying the huge caldera left by the massive eruption of the Dakataua volcano some 1,150 years ago and then dotted along the long and narrow isthmus are three smaller volcanoes. The final approach into Hoskins is overshadowed by the large Mount Pago volcano, and its two smaller siblings, whose periodic

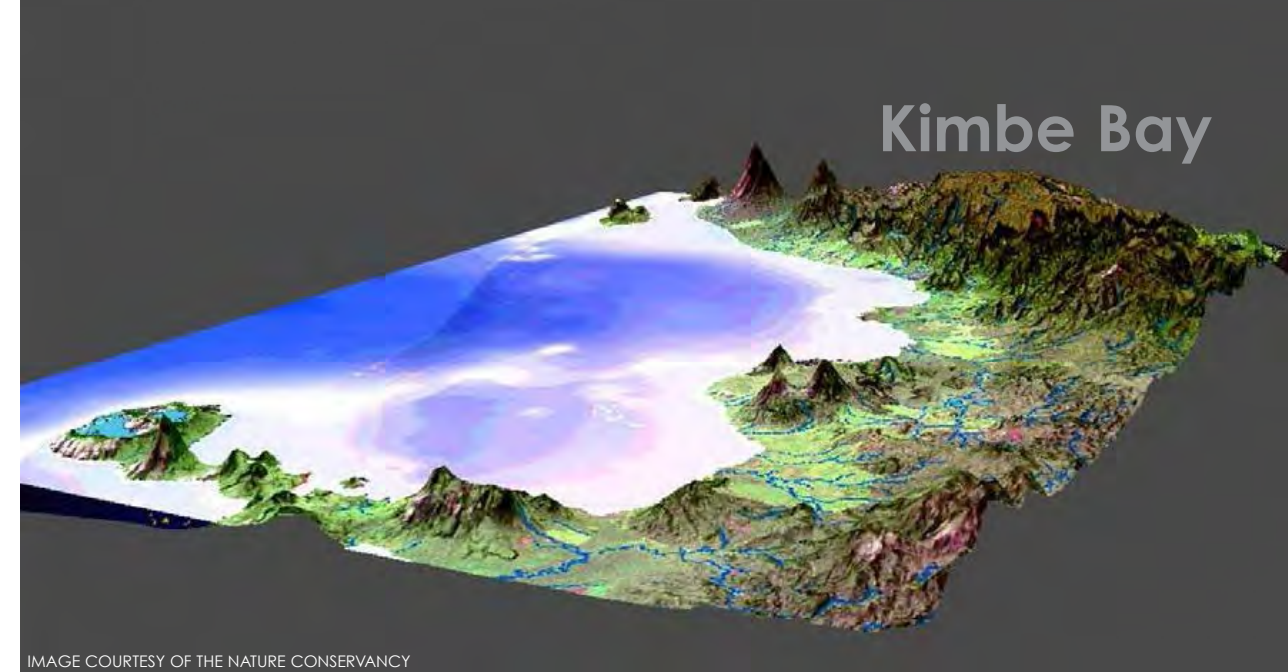


IMAGE COURTESY OF THE NATURE CONSERVANCY

rumblings provide very poignant reminders of the powerful seismic phenomena far underground that created those volcanic uplifts.

Beneath Kimbe Bay

Bounded by the long Willaumez Peninsular to the west and Cape Tokoro, some 140km to the east, Kimbe Bay is sheltered from the

worst of New Britain's weather. Along the coastal area of the bay, a 200m shelf runs parallel to the shore for about 5km before dropping down to around 500m and up to 1,000m in the eastern part. On the northern outskirts of the bay as it approached the Bismarck Sea, the seafloor drops off rapidly to in excess of 2,000m.

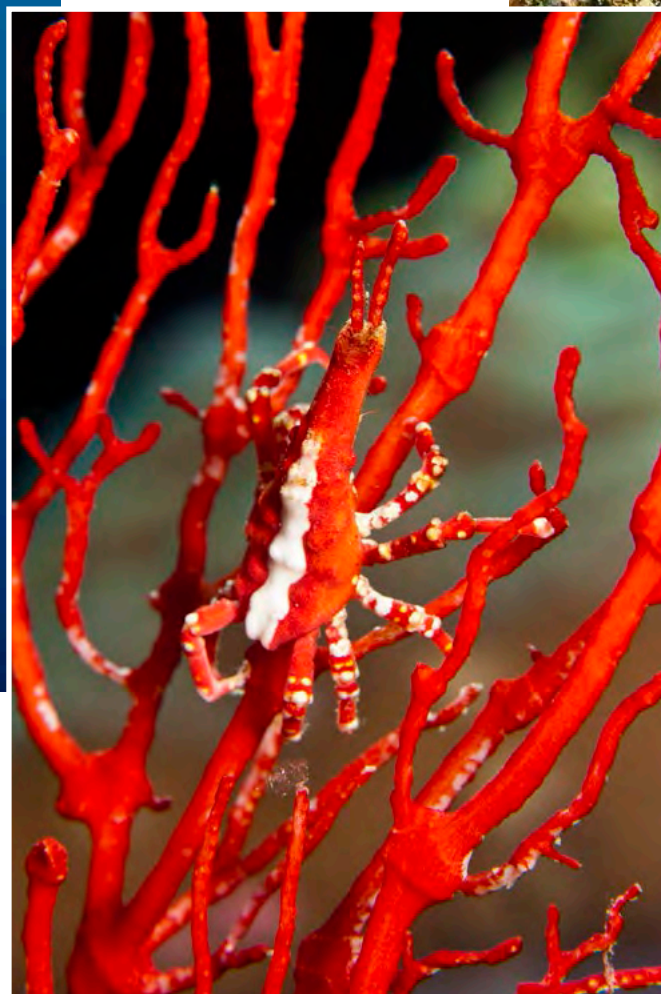


IMAGE COURTESY OF WALINDI RESORT

Schooling barracuda at Bradford Shoals (left); Coral crab at Susan's Reef (below); Incredible coral garden at Charmaine's Reef (right)

benign conditions function as a kind of marine nursery and are fundamental to the incredible biodiversity of Kimbe Bay, but the other significant element are the nutrient-rich currents of the Bismarck Sea that provide the nutrients to sustain the bay's residents and visitors.

To the south of New Britain are the 4,000m deep-water basins of the Solomon Sea which the Southern Equatorial Current crosses as it makes its way towards the Bismarck Archipelago. As this powerful current approaches the south



coast of New Britain, it creates upwellings that suck up the nitrogen and phosphorous laden detritus of the sea from the deep basins. Those nutrients are carried north through the Vitiaz Strait in the west, and the St Georges Channel (between New Britain and New Ireland) in the east, in to the Bismarck Sea where they enter the predominantly anticlockwise circulation produced by the regional current flows.

As those currents flow along the north coast of New Britain and around the top of the long and narrow Willaumez Peninsula, eddies are

produced in the western part of Kimbe Bay that direct the nutrient rich flows into the bay and induce further upwellings from the deep water basins to the north.

In a nutshell, the incredible forces of nature have combined to produce an almost perfect natural environment to create and sustain the coral crucible and the creatures that cohabit with it.

Diving Kimbe Bay

Kimbe Bay is one of the global locations that most divers want in their logbooks. But it is a special kind of diving, as it's not a shark-lover's paradise or somewhere

you go because manta rays or whale sharks aggregate at certain times of the year. My personal definition would be "fish-bowl" diving, as it is like being immersed

in a fully stocked aquarium, but with a considerable random factor of nature in that you never know what is going to come in from the blue—such as *that* day at Susan's Reef, when I left three other divers on the deco line at

the end of my safety stop and got back in the dive boat.

Vaguely wondering what was taking them so long, I am sure you can imagine my reaction when they eventually got in the boat

"I am hard pressed to think of anywhere on Earth that has this combination of vibrant health, diversity and beauty."

— Professor Charles Veron, chief Scientist of the Australian Institute of Marine Science, on the reefs of Kimbe Bay (March 2008)

Across this deep seascape are dramatic seamounts and coral pinnacles that rise up towards the surface and provide isolated ecosystems for the marine creatures of the bay. The seamounts in particular act as

beacons to the bay's diverse and prolific pelagics and marine mammals—with 12 species of mammals identified to date, including sperm whales, orcas, spinner dolphins and dugong. The deep waters and generally



Beautiful sponges bask at Otto's Reef (left); Schooling barracuda at Bradford Shoals (below); Superb soft corals at Susan's Reef (right)

no guarantees, but on any given day you are almost certain to see large schools of barracuda, big-eye trevally, dog tooth tuna, unicorn fish and fusiliers. Add in to that mix the meandering but skittish white-tip reef sharks, the cruising gray reef sharks out in the current and the chance to see a great hammer head on an occasional foray up from the deep.

Then there is the visibility of often in excess of 40m, and you can probably understand how I came up with the name fish-bowl diving.

When to dive Kimbe Bay

Kimbe Bay is protected from extreme weather by its unique topography and access to the reef systems is available throughout the year. September through

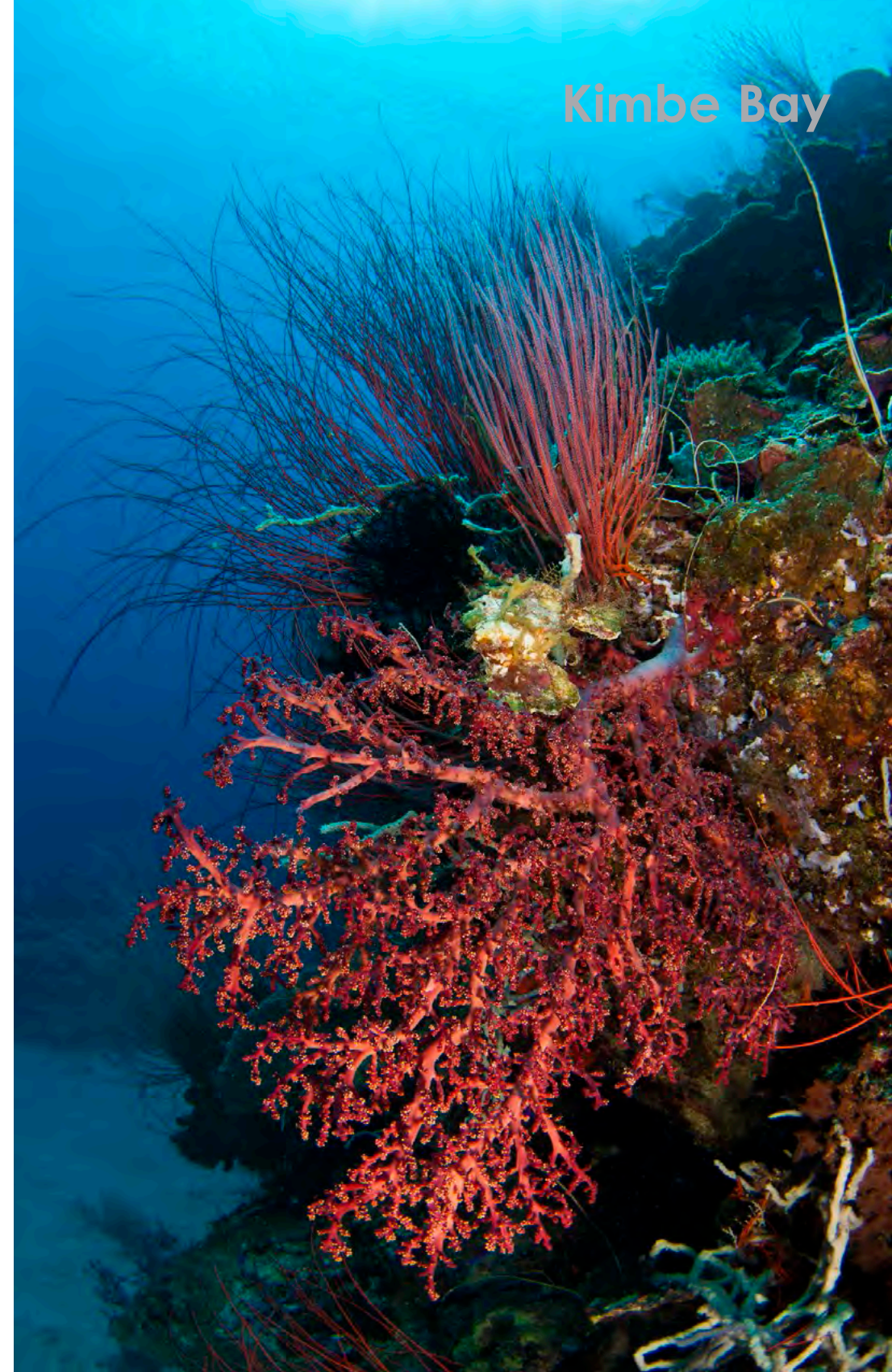
some ten minutes later and very excitedly explained that a large sailfish had come in just after I left, and repeatedly checked them out before heading back out in to the blue again.

The random factor is particularly prevalent at the seamount dives such as Bradford Shoals, which is located on the very edge of the bay where the seafloor is some 1,500m below. Rising from that abyss to within 20m of the surface, its reef structure is mainly flat plates of hard corals, which are not particularly photogenic, however, amongst the plates are numerous colorful small reef fish—but very few divers go to Bradford Shoals to see reef fish, because it is what is above the reef that catches the eye.

Surrounded by deep blue water and quite distant from the nearest reef structure, Bradford acts as a magnet for big fish and pelagics. The sea is the sea and offers



Kimbe Bay



to the end of November sees calm seas and superb visibility in excess of 25m, but slightly colder water of 27°C, which usually more critters. December is changeable and hard to predict as the wet season approaches in January and goes through to March,

bringing with it calm waters again and warmer waters around 29°C, but lower visibility around 15m. May through June is the doldrums with very flat seas, hardly any wind and clear skies. The water temperature goes up to around 31°C and visibility is in the range



Coral garden at Otto's Reef (left); Diver with schooling barracuda at Joel's Reef (right)

Canada, but all that changed when they bought the 800-acre Walindi palm oil plantation in 1969.

The intention was to modernize and improve the plantation's operation, but by the early 1970s, they had started to scuba dive on the weekends and were literally the first people to discover the incredible biodiversity of Kimbe Bay. The rest is history, and in 1983, Max and Cecilie started Walindi Plantation Dive Resort, which has grown into a significant business complete with its own liveaboard dive boat capable of exploring the most remote locations of New Britain.

Walindi operates three day boats, each of which can accommodate six to eight divers and two to three dives per day, with two dives being the norm and the third available on request. Night dives are also available by arrangement. The dive boats leave about nine in the morning and return in the late



Kimbe Bay

of 20m. July through August see the southeast trade winds start to blow at up to 20 knots, which means that the seas in Kimbe Bay can reach up to 1m and the water temperature starts to drop. Visibility is usually around 15m.

Preserving Kimbe Bay

When Max and Cecilie Benjamin

arrived in New Britain in the late 1960s, they had only minimal interest in what was below the surface of Kimbe Bay, as they were agronomists whose principal focus was what came out of the ground, rather than the sea. Their assignment in Papua New Guinea was supposed to be a short-term one on their way to a new life in

afternoon with lunch being taken along and provided on one of the islands in Kimbe Bay.

The resort has 12 self-contained

bungalows, each with its own bathroom and located just back from the beach under the shade of the many palm trees. There is a central area with a swimming pool and sun deck, dining room, lounge and bar area and the whole resort has a very pleasant laid back feel.

The Benjamins' training as agronomists taught them to take a long-term and sustainable approach to their businesses, and by the early 1990s, they were seeing significant changes happening in the Kimbe Bay area, which if left unchecked could only degrade the pristine environment.

Up until the mid-1980s, the local population lived the same sustainable, subsistence lifestyle they

had for centuries, with virtually no impact on the marine life of the Kimbe Bay. But by the end of the 80's, it was becoming apparent that the development of the palm oil industry in New Britain was changing the traditional lifestyle in Kimbe Bay as economic migration into the area, along with high natural rates of population increase, had resulted in a steadily rising population density in the urbanized areas.

The increasing population placed far greater pressure on the local terrestrial and coastal ecosystems because of the rising demand for food, firewood and building materials plus a significant increase in pollution. Further compounding the situation, as new people and new ways flooded into the area, was the move away from traditional cultural practices, which had evolved over the centuries to support and



Main lodge at Walindi Plantation Resort



Superb sponge garden at Charmaine's Reef (above); Tube sponges at Restorf Island (top right); Mahonia Na Dari (left)

enhance the sustainable subsistence lifestyle of Kimbe Bay.

In 1993, the Benjamins joined forces with the local government and The Nature Conservancy (TNC) to develop an overall long-term conservation strategy for

Kimbe Bay faced environmental challenges going forward, it had largely escaped the ravages of cyanide and dynamite fishing associated with the live reef fish trade, which had wreaked so much damage to coral reefs

across Southeast Asia.

The following year TNC, supported logistically by Walindi, conducted the first ever evaluation of the marine environment of Kimbe Bay to try and quantify its biodiversity. A Rapid Ecological Assessment (REA) was done with a specific focus on the coral reefs which, although considered to be little more than lifeless and indestructible rock formation by the native people of Kimbe Bay, play a very important role in local culture and mythology. The results of the REA were staggering as they revealed for the first time the magnitude of the bay's marine diversity, with a total of 860 species of fish and 345 species of stony corals identified on the 78 sites visited.

To safeguard that incredible

diversity would require an innovative and proactive approach, the key to which was education, for if the local people do not appreciate what is under the water in Kimbe Bay, how can they be expected to preserve it? A two-pronged strategy was developed consisting of the establishment of Mahonia Na Dari and Locally Managed Marine Areas (LMMA's)

Mahonia Na Dari

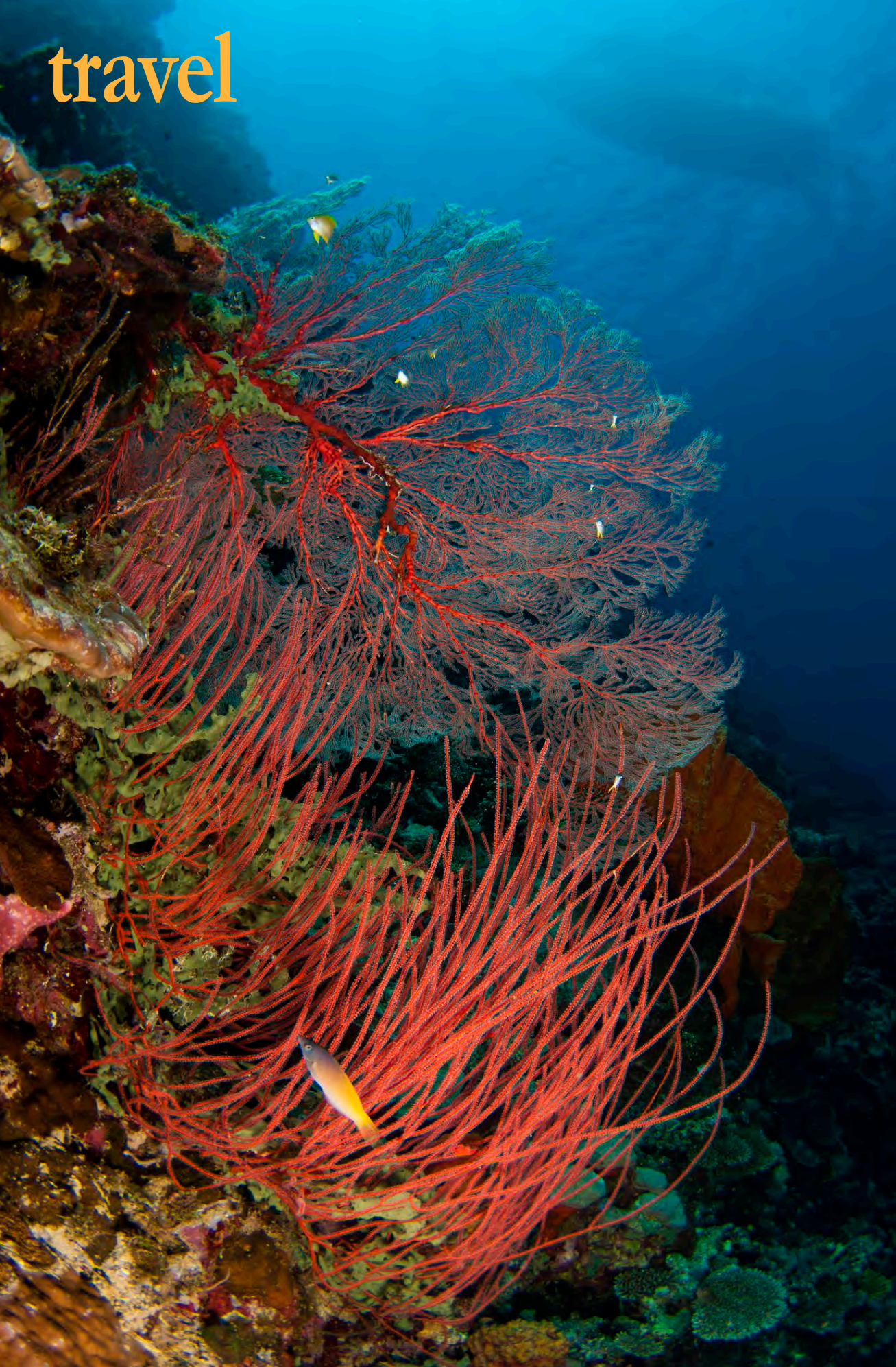
—*Reconnecting the Disconnect* Unusually for Papua New Guinea, the people of New Britain have a limited connection with the rich waters that surround the island—with few children learning to swim and many residents of inland villages never having even seen the ocean. Working together with TNC, and the EU's Islands

Region Environmental Program, Max and Cecile Benjamin established Mahonia Na Dari (Guardians of the Sea in the local Bakovi language) in 1997 on land they owned next to the resort.

The goal of Mahonia is to develop and instill an awareness of Kimbe Bay's unique environment so that its protection and conservation can become self-fulfilling, and it does this by educating the young people of the area through its Marine Environment Education Program (MEEP). The program takes students, many of whom have no experience whatsoever of the marine environment, out on the water where they can see things first-hand and better understand the need for the conservation and protection of Kimbe Bay.



Goby on soft coral at Susan's Reef



Sea whips and soft coral at Susan's Reef



MEEP has been very successful and has led to three student focused versions being developed: Baby MEEP for elementary schools, Junior MEEP for primary schools and Intensive MEEP for secondary schools, plus a Teachers MEEP to enable primary school teachers to conduct classes in their schools.

Since it was first established in 1997 it has been estimated that Mahonia Na Dari's programs have benefited directly or indirectly in excess of 200,000 people have. As the old Chinese saying goes: "If you are planning for a year, plant rice; if you are planning for ten years, plant trees; if you are planning for 100 years, plant education."

Locally Managed Marine Areas

Locally Managed Marine Areas (LMMA's) are a well-established strategy throughout the Pacific Islands and are considered the best way to help local communities self-manage their marine resources in a sustainable manner and ensure a high degree of protection for the environment. However, in an area such as Kimbe Bay where the sea is considered an unlimited resource and reefs are thought of as lifeless rocks, LMMA's in isolation would have little chance of success. The entire community has to embrace the concept for it to work and without the MEEP programs run by

Mahonia this simply would not happen—hence the two-pronged approach.

Much has been learned since the first LMMA was established at Kilu next door to Walindi in 1998, and the village elders have proven to be a key ingredient to success as they usually understand intuitively the basic need for conservation

Kimbe Bay

and sustainability and will help to cascade the message down through the village ranks in the local dialect (Tok Ples).

A major obstacle to overcome as additional LMMA's were established was the culturally intricate nature of the Kimbe Bay area, which has more than 100 socially diverse communities, with each one holding complex and often overlapping traditional rights to sea resources. So it was essential to establish clear boundaries for the LMMA's and then quantify the initial situation through evaluations of coral growth, sea grass coverage and species count so that no-take zones to allow recovery on damaged reef areas and open areas where fishing is allowed can be established.

Another key component of the overall MEEP and LMMA programs was to halt and eventually eliminate the spread of *poison rope* fishing and prevent the encroachment of dynamite fishing. Poison rope fishing uses the Derriss Root,

Clown fish and anemone at Inglis Shoals; MV *Febrina* at anchor at Walindi (top center)



which grows naturally in Kimbe Bay, whereby the plant roots are smashed with a rock and then the fisherman swims down and sticks it in the corals. In the white pulp of the roots is the poison Rotenon, which kills small fish and coral polyps, but forces larger fish to

the surface where they are easily caught.

Dynamite fishing is not the scourge of PNG it is in other Southeast Asian countries, but does occur in Kimbe Bay from time to time on an opportunistic basis using dynamite that has



CLOCKWISE FROM LEFT: Sponges at Susan's Reef; Local village kids playing near Mahonia Na Dari; Sunrise in Kimbe Bay; Beautiful sea fan at Vanessa's Reef

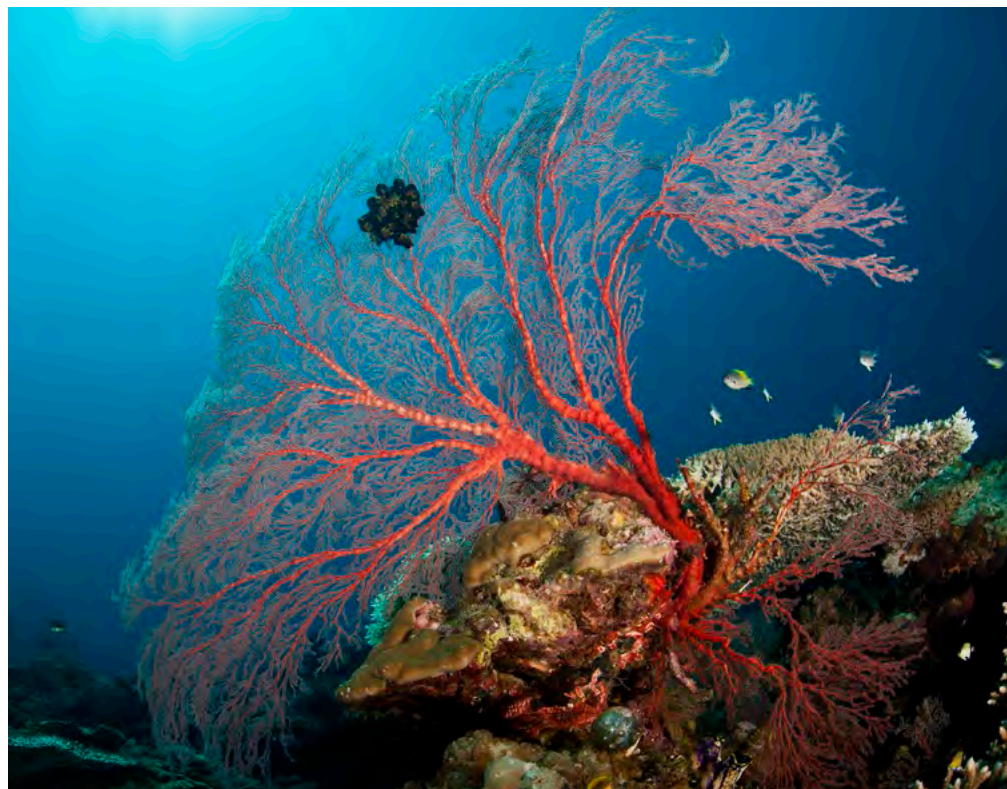
been "harvested" from WWII ammunition found in the rainforest and then shoved into SP beer bottles.

Funding for boats and engines by the provincial government enables the villagers to monitor their no-take and open area zones, and keep poachers at bay, while Mahonia provides periodic audits to keep the system honest and encourage sustainable fishing practices such

as hand lines and spears. There are now a total of eight LMMA's established in the Kimbe Bay area, with more planned going forward.

The Crucible

Papua New Guinea is very much a developing country but it is awash in minerals, amazingly diverse, physically stunning and surrounded by some of the richest waters anywhere in the world. It



Kimbe Bay

is also a difficult place to do business with a system of governance that leaves much to be desired. The perseverance of individuals like Max and Cecilie Benjamin to open up the wonders they find underwater in their backyard is admirable, but their sheer determination to protect and conserve it deserves a standing ovation. □

Asia Correspondent Don Silcock is based in Bali and travels widely throughout Asia. His website has extensive information and image galleries on the diving in Papua New Guinea and other great dive locations across the Indo-Pacific region. Visit: www.indopacificimages.com

fact file



Papua New Guinea



SOURCES: U.S. CIA WORLD FACTBOOK,
WWW.PAPUANEWGUINEA.TRAVEL/DIVING

History Papua New Guinea is a developing country in the Southwest Pacific. The eastern half of the island is the second largest in the world. In 1885, it was divided between the United Kingdom (south) and Germany (north). In 1902, the United Kingdom transferred its half to Australia, which occupied the northern portion during World War I and continued to administer the combined areas until independence in 1975. After claiming some 20,000 lives, a nine-year secessionist revolt on the island of Bougainville ended in 1997. Today, Papua New Guinea relies on the assistance of Australia to keep out illegal

cross-border activities from Indonesia primarily, including illegal narcotics trafficking, goods smuggling, squatters and secessionists. Government: constitutional monarchy with parliamentary democracy. Capital: Port Moresby

Geography Oceania, Papua New Guinea is a group of islands east of Indonesia including the eastern half of the island of New Guinea between the Coral Sea and the South Pacific Ocean; Along its southwestern coasts, it has one of the world's largest swamps. Coastline: 5,152km. Terrain: mostly mountainous with rolling foothills and coastal low-

lands. Lowest point: Pacific Ocean 0m; Highest point: Mount Wilhelm 4,509m.

Climate

Tropical climate with slight seasonal temperature variation; the northwest monsoon occurs December through March; the southeast monsoon

occurs May through October. Natural hazards: active volcanism, as PNG is situated along the Pacific "Ring of Fire". The country experiences frequent and at times severe earthquakes, mud slides and tsunamis.

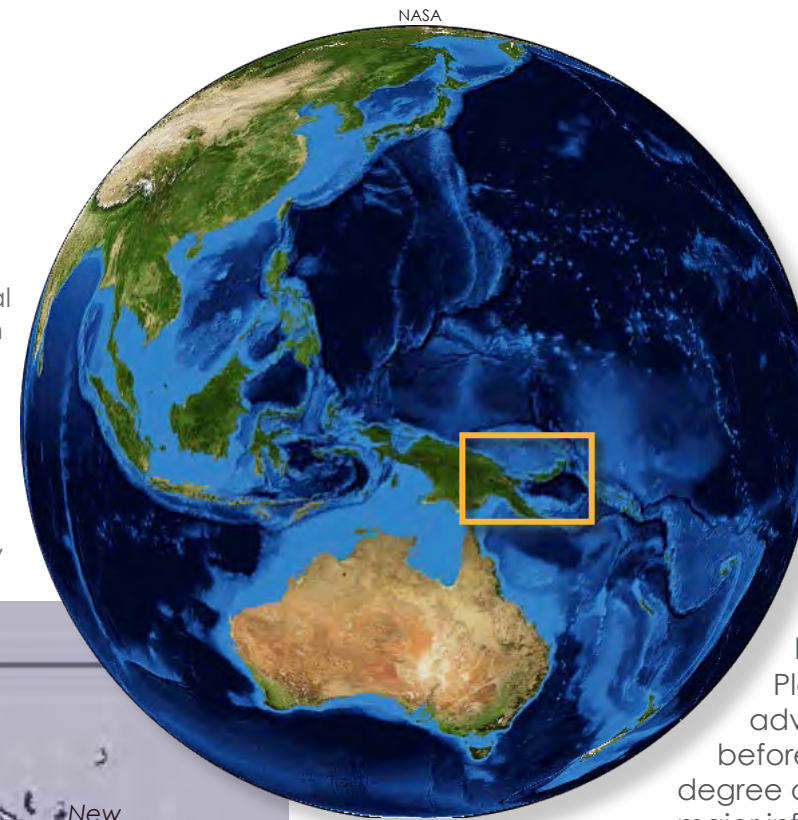
Economy

Natural resources abound in PNG. However, getting to them has been difficult due to the rugged terrain, issues with land tenure as well as expensive infrastructure development.

Around 85% of the population live on subsistence farming. Two-thirds of export income comes from mineral deposits such as copper, gold and oil. Estimates of natural gas reserves come to about 227 billion cubic meters. Construction of a liquefied natural gas (LNG) production facility planned by a consortium led by a major American oil company could develop export of the resource in 2014. It is the largest project of its kind in the history of the country

and could help the nation double its GDP. Transparency will be a challenge for the government for this and other investment projects planned. Other areas of development by the government include more affordable telecommunications and air transport. Prime Minister Peter O'Neill and his administration face challenges that involve physical security for foreign investors, building investor confidence, increasing the integrity of state institutions,

RIGHT: Global map with location of Papua New Guinea
BELOW: Location of Kimbe Bay on map of Papua New Guinea
BOTTOM LEFT: Fire red sea whips at Kirsty Jane's Reef in Kimbe Bay



Motu is spoken in the Papua region; there are 715 indigenous languages—many unrelated.

Health & Safety

Papua New Guinea has a high crime rate. Please check state advisory consular information before travelling to PNG. The degree of risk is very high for major infectious diseases; food or waterborne diseases include bacterial and protozoal diarrhea, hepatitis A and typhoid fever; vectorborne diseases including dengue fever and malaria are high risks in some locations (2004)

Currency

Kina (PGK). Exchange rates: 1USD=2.45PGK; 1EUR=3.28PGK; 1GBP= 4.09PGK; 1AUD=2.28PGK; 1SGD=1.96PGK

Environment

Growing commercial demand for tropical timber is causing deforestation of the PNG rain forest. It also suffers pollution from mining projects and severe drought;

Population 6,552,730 (July 2014 est.) Ethnic groups: Melanesian, Papuan, Negrito, Micronesian, Polynesian. Religions: Roman Catholic 27%, Protestant 69.4%, Baha'i 0.3%, indigenous beliefs and other religions 3.3% (2000 census). Internet users: 125,000 (2009)

Language Melanesian Pidgin serves as the lingua franca, English is spoken by 1%-2%,

Decompression Chambers

Melanesian Hyperbaric Services Jacksons Airport, Port Moresby, Papua New Guinea Tel: +675 693 0305 or +675 693 1202 Port Moresby Medical Service Tel: +675 325 6633 or +675 693 4444

EVACUATION INSURANCE is compulsory for some PNG dive operators, liveaboards and resorts. See DAN for information and travellers insurance: www.diversalertnetwork.org

Websites

Papua New Guinea Tourism www.pngtourism.org.pg



POINT & CLICK
ON BOLD LINKS



Edited by
Rosemary 'Roz' E. Lunn

Equipment



New Yacht Toy

When it comes to purchasing your own private submarine, there is quite a choice. U-Boat Worx has just unveiled their latest contribution; the Super Yacht Sub 3. This is capable of taking you, plus two friends to a maximum of 300m / 984f. As you would expect it comes complete with luxury leather seating and an air-conditioned environment. U-Boat Worx state the six powerful thrusters can handle strong currents, and you can get quite decent bottom times. The 42kWh lithium-ion batteries have a burn time of 12 hours. Prices start from €1,750,000. **UboatWorx.com**

Heptastar

The Green Force Heptastar 2000 DPM light head has seven LED's generating 2,000 Lumens. This anodized aluminum light head is incredibly mean when it comes to power consumption, a mere 21 Watts, which translates into good burn times. The Heptastar 2000 DPM runs on batteries ranging from six to 18 Volts, hence the burn time depends on the battery you screw this light head into. The 'DPM' in the name refers to 'Dynamic Power Management'. In other words the light automatically adjusts the level of illumination according to the amount of light that is required. Close up objects do not require huge illumination, whilst objects in the distance, or during an emergency, require full illumination. It appears to be a very sturdy product and in fact Green Force states it is almost indestructible. **Green-force.com**



J2

Fourth Element has augmented their thermal underwear range with the launch of the J2 collection. These garments were specifically designed for the 2013 deep caving expedition to the Mexican Cheve Cave system, hence the name. The team spent several days underground, therefore they needed base layers that could stand long repetitive wear without the risk of skin infections developing. One way of reducing this risk is to keep the skin dry. The fabric has a unique knit that minimises contact with the skin, allowing air to circulate, whilst having enough fibres to wick away sweat. In addition the fabric is bacteriostatic and anti-fungal, thanks to anti-microbial silver ions embedded within the fibres of the fabric. The result is a lightweight compact base layer than can be worn for extended periods beneath a drysuit. **FourthElement.com**



Beach Bag

Sometimes you just fancy a simple day snorkelling or playing on the beach, and want an easy solution for carrying your kit, and keeping your wallet and keys safe. This brightly coloured and highly functional beach bag from Subgear has a discrete zipped pocket at the front for goodies you don't want to get wet. Fins are securely stored in a separate pocket, with the mask and snorkel stashed in another compartment. (All kit is easily accessed via elongated zips). The heavy-duty nylon bag benefits from a number of integrated mesh panels that allow excess water to drain away, and there are two options for carrying it—a padded single shoulder strap or a side handle. **Subgear.com**

Connector

When the European Standard for oxygen connection came into force in August 2008, it was supposed to help make diving safer. Cylinders containing greater than 22% oxygen were meant to have a different thread to help prompt the diver to consider what they were breathing. Instead it has been a source of major frustration and, where possible, ignored by the community. But what do you do when you want to get a tank filled that has an M26 valve fitted and the air station only has M25 whips? Alternatively if you have a M26 first stage and need to dive a M25 valved tank, what is the solution? AP Diving has a range of relevant adaptors that you can simply screw in place. **APDiving.com**



Checking out the bottom

Aqua-Vu's Micro Series is a complete underwater camera system no bigger than a smart phone. Yet it is an economical underwater viewing system featuring full-blown features at a fraction of the price. Playing live color underwater video on a 3.5-inch LCD, the Micro II includes 50 feet of camera cable wrapped on the integrated viewscreen. Micro camera is the size of a bottle cap, includes auto IR lighting and enters the underwater world with an amazing stealth that won't spook fish. aquavu.com



Pelican ProGear Elite

Renowned hard case manufacturer, Pelican, has launched a new product line called the ProGear Elite series. The collection includes a 22-inch Carry-On (shown), a 27-inch Weekender and a 30-inch Vacationer. All models are available with an optional enhanced travel system that includes a lid organizer, a toiletry kit, and a zipped shoe sack. Each case benefits from an integrated TSA-approved combination lock, a smooth fabric interior for simple clean up and custom-designed solid-hub wheels for easy maneuverability. Pelican states the 'Press & Pull' latches ensure the luggage will remain secure under the stress of rough baggage handling and the demands of travel. Pelican.com



Britannic

Otter has announced that divers now have the option of colour accents on the MK2 Britannic drysuit. This trilaminate/shell suit was originally developed in 1987 by the British manufacturer for Kevin Gurr's expedition to HMHS *Britannic*. Over the years this suit has been 'the suit of choice' for many expeditions diving the iconic wreck. In 2013, Otter launched the MK2 version. Fans of Otter find this suit lighter than its parent. Otter has developed a flexible armour skin that is malleable, strong and does not weigh much. The MK2 Britannic benefits from a telescoping torso, choice of pockets and valves (Sitech or Apeks), big double knee pads and a neoprene neck warmer as standard. Optional extras include a choice boot; either a dry neoprene sock/rock boot combo, or a traditional drysuit boot; dry glove systems, replacement silicone neck and wrist seals. Drysuits.co.uk



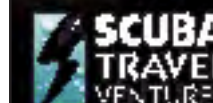
Sidekick

The KISS Sidekick is a streamlined, lightweight rebreather system that has been designed specifically for side-mount diving applications. Due to its compact size and mounting position, it can also be carried as a bailout rebreather (BOB) system. It is a mechanical rebreather, so there are no electronics controlling the gas addition to the system. Both the head and scrubber is placed inside a large single counterlung, which in turn is housed within and protected by a cylindrical shaped stainless frame, making for a small and lightweight rebreather with fewer parts and less complexity than diving a fully closed circuit rebreather. By shunting a portion of each exhaled breath back into the loop, this device will extend the duration of a given gas supply by a factor of three. The benefits of this type of gas-extension provide advantages for both recreational and technical diving. Note that proper training outside the level 1 GEM Sidekick course is required prior to doing any technical diving. KissRebreathers.com

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A diver explores a rich coral reef

A closer look at

Biodiversity

— At the Heart of the Coral Triangle

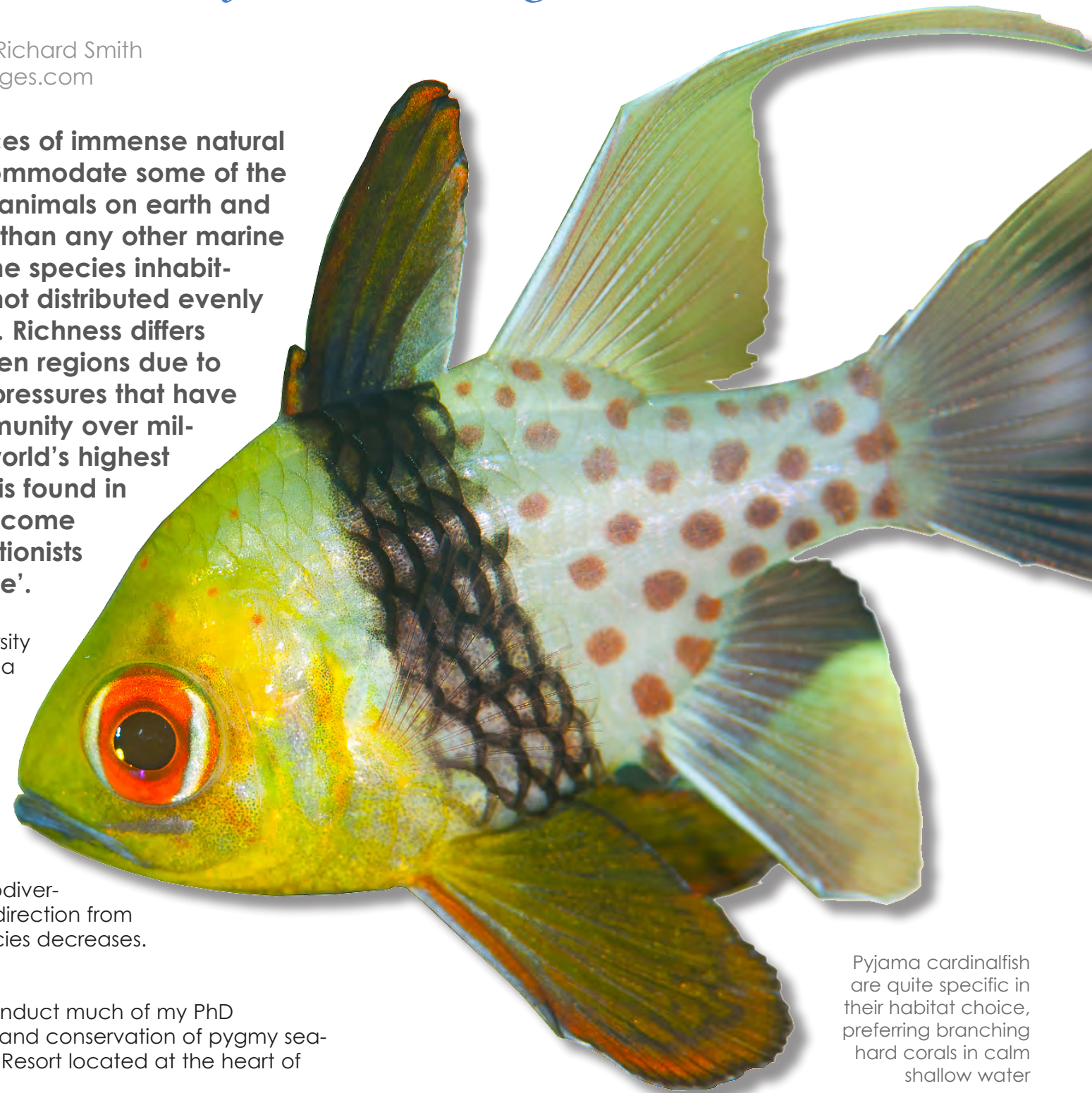
Text and photos by Dr Richard Smith
www.OceanRealmImages.com

Coral reefs are places of immense natural diversity. They accommodate some of the highest densities of animals on earth and have more species than any other marine habitat. However, the species inhabiting coral reefs are not distributed evenly through the oceans. Richness differs dramatically between regions due to the many different pressures that have molded each community over millions of years. The world's highest marine biodiversity is found in an area that has become known by conservationists as the 'Coral Triangle'.

This region of mega-diversity is a roughly triangular area extending from central Indonesia to Papua New Guinea and the Solomon Islands, and northwards to the Philippines. This relatively small area, on a global scale, boasts the world's richest marine biodiversity. As you travel in any direction from there the number of species decreases.

The richest reefs

I was lucky enough to conduct much of my PhD research, on the biology and conservation of pygmy seahorses, at Wakatobi Dive Resort located at the heart of



Pyjama cardinalfish are quite specific in their habitat choice, preferring branching hard corals in calm shallow water





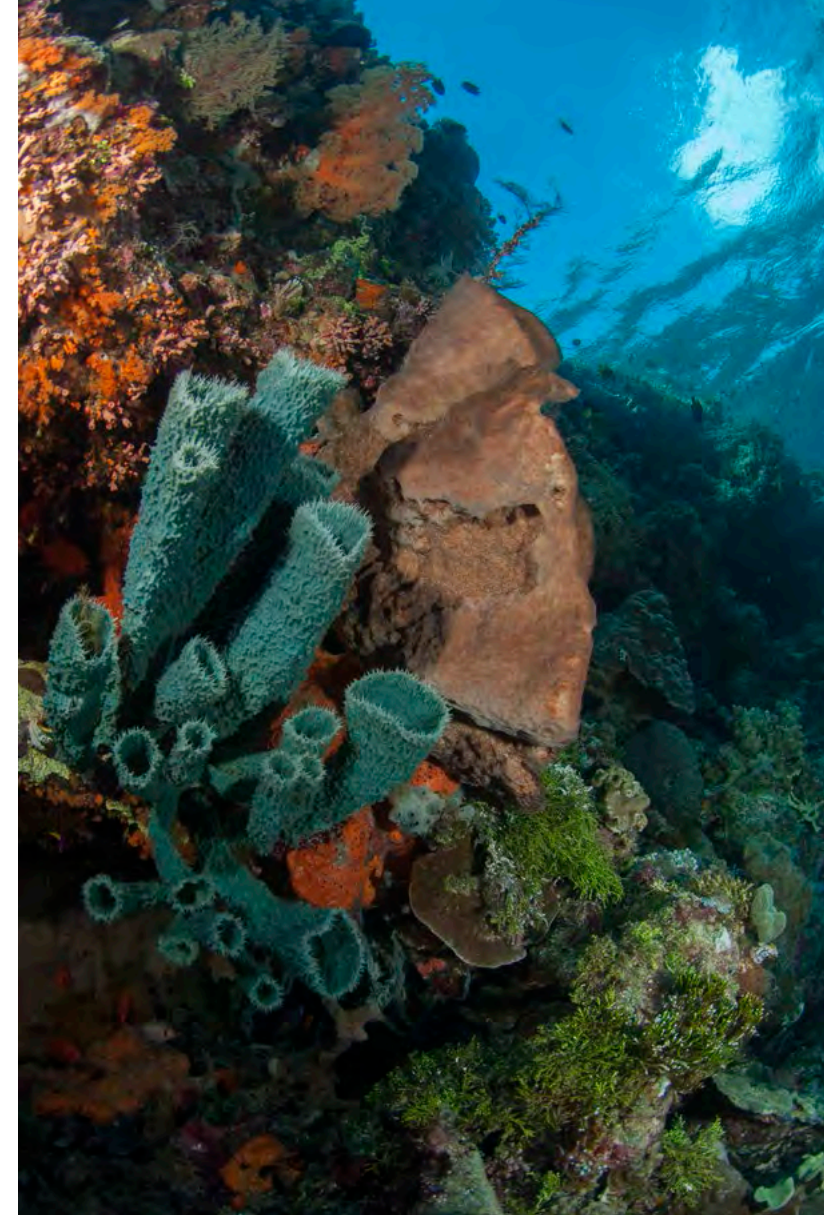
Coral reefs are the world's most biodiverse marine ecosystem



Rough-shout ghost pipefish are rare inhabitants of muck dive sites, preferring the protected sand or rubble slopes to coral reefs



Seagrass meadows harbor a unique assemblage of marine life. Robust ghost pipefish are common in this habitat but hard to find due to their uncanny mimicry of dead seagrass fronds



A shot showing a diverse reef of sponges, halimeda algae, hard and soft corals in the Tukangbesi archipelago

the Coral Triangle. For more than six months, over a three-year period, I dived the reefs and really got chance to appreciate the amazingly high biodiversity of this region. Due to the nature of my work, I spent hundreds of hours in one specific location on the reef and as a result got to know the area like the back of my hand, and the local residents like family.

Over the years I had the opportunity to appreciate the change, or lack thereof, on the reef. Astoundingly over the three years, there was almost no perceptible change in the size of sponges, whips and soft corals in my small

overhang on the Wakatobi House Reef. I was constantly amazed that, even after six months, I would still encounter something new almost daily. One day I found a tiny beige frogfish half the size of my little finger nail, the next a nudibranch I had never seen before crawling across my path and the following evening a bright orange shrimp crept from beneath a sponge. Such is the Coral Triangle, the world's most biodiverse marine habitat.

Today's diversity

Today, the two main areas of reef diversity centre on the Caribbean

and Indo-West Pacific. The biodiversity in these two areas, however, is quite different: the species richness in the Indo-West Pacific vastly surpasses that of the Caribbean. The Indo-West Pacific supports at least 600 species of coral and 4,000 fish, compared to 62 and 1,400 species respectively in the Caribbean. The species count for either fish or corals in one Indonesian bay can exceed the number of species found in the entire West Atlantic. In fact, for the majority of reef organisms there are 10-30% as many species in the West Atlantic as Asia, and no reef-associated fish species are shared



Pontoh's pygmy seahorses attain a maximum length of less than 2cm

between the two bodies of water. Whilst the number of species in the Caribbean appears low, they are in fact entirely different to those of the Pacific due to millions of years of separation.

There is some debate over the explanation for such high Asiatic diversity. One theory is that the area is a hotbed for evolutionary change and species are created here, with some eventually spreading to other regions of the Pacific. Another possibility is that the ranges of many species from the Indian and Pacific Oceans overlap in the Asian archipelago, causing higher diversity where they coexist. In addition, the geology of the region has origins in many areas, each with their own fauna. The Australian and continental Asian land fragments

each contribute their own unique assemblage of organisms.

Whilst the true explanation is probably a combination of these factors, the most simple and palatable reason for high diversity is the huge diversity of habitat types in the Coral Triangle. The profusion of different habitats equals a correspondingly high diversity of organisms to inhabit them: sheltered inner shore habitats have their own set of species, whilst exposed atolls have another. Beneficially, the Coral Triangle has also avoided the mass extinctions that have blighted other areas over the millennia. Instead, the Coral Triangle has been blessed with long periods of warm, stable conditions fostering the persistence of species.

Fish doctors without borders

Last year I had the opportunity to join Wakatobi's liveaboard, Pelagian on an itinerary that ventured beyond the resort's reach and explored other islands in the chain. Whilst the resort has a profusion of different habitats including steep walls, pinnacles, ridges and bays, I had often heard about the muck dives found on Buton island, close to the Sulawesi mainland. Muck dives are interesting as they host a diverse set of species you are unlikely to see in other habitats, due to their distinct set of environmental conditions. Ghost pipefish, seahorses, frogfish and countless other oddities make this their home. It is a perfect example of the influence habitat diversity can have on overall species richness. The mangrove



A small soft coral cowrie feeding on a Dendronephthya coral



Nudibranchs reach their highest diversity in the Coral Triangle, Nembrotha lineolata



Even the infamous Crown of Thorns seastar serves a role on a healthy coral reef. Only when humans disrupt the ecosystem do they reach plague proportions



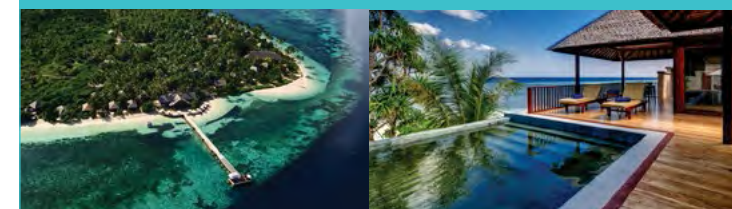
A huge cuttlefish rests next to a huge gorgonian coral



A rare crab found only on nocturnal feather stars



An experience without equal



"After 20 years of diving around the world, we are speechless for the first time. Whoever thinks that he knows what diving is about does not know Wakatobi. For sure this is the last paradise on Earth!"

Marties and Wolfgang Liebau, November 2013



www.wakatobi.com

forests, shallow seagrass beds and even the open ocean are just a few of the other habitats that contribute their own collection of unique species to the Coral Triangle.

During our tour of the Tukangbesi archipelago, in which Wakatobi Resort lies, I also came across, for only the second time, a pair of Denise's pygmy seahorses living on a whip coral colony. Unusual associations and biological quirks such as this seem quite commonplace in the Coral Triangle. With the Coral Triangle as a production line for new species, it might be that these pygmy seahorses, or their offspring, are better adapted to life on a whip coral. In many generations time it might be

that these pygmies split off to become a new, distinct species.

Endemism: riding the wave

As well as accommodating the highest number of species in the Indo-Pacific, South East Asia also has the greatest number of endemic or indigenous species (species that occur nowhere else). Certain areas of the ocean are more prone to high levels of these restricted range species: Hawaii has 86 species of endemic reef fish, the Red Sea 41, New Caledonia 43 and the Great Barrier Reef 33. The Coral Triangle vastly outshines all these areas, with over ten percent of its almost two and a half thousand species found only there.

In 2007, when I was first at Wakatobi conducting my pygmy seahorse observations, one of the guides found a tiny pipefish-like fish. It was distinct in several ways: it's miniature stature of less than 3cm in length, strange swimming method resembling a sea dragon and red wisp-like filament on the head all indicated to me this was something new. Later that year the pygmy pipehorse, *Kyonemichyths rumengani*, was scientifically described. Known initially only from Sulawesi in Indonesia, this tiny fish is now also recorded from Halmahera and Raja Ampat and seemingly making it another Coral Triangle endemic.

Currents play a major role in the movement of organisms around the

ocean, and reef communities can become isolated from others depending on local current systems. The East Australian Current, for example, flows from tropical equatorial waters towards the much cooler waters of southern Australia and Tasmania. This effectively backs the reef organisms up against uninhabitable cold waters, isolating the organisms from other populations and fuelling their evolution into distinct species.

Certain species are especially susceptible to such conditions and form a higher than average proportion of the endemics. Those species whose juvenile forms spend long periods drifting in the ocean as miniscule larvae tend not



A small dotyback emerges from inside a protective tunicate

to become isolated as they are able to reach distant reefs during this period, increasing their range. Other species, such as anemonefish and dotybacks, have well-developed young that settle very quickly on the local reef. The young, therefore, do not get chance to move far from their place of birth before settling, and thus have a propensity towards endemism.

Human impact

Patterns of marine biodiversity around the globe are historically quite stable and species evolve to fill a specific role within their own community. Man's technological advances have had unexpected affects on marine organisms, as they can now reach areas that were once physically well beyond their reach. The Suez and Panama

canals link bodies of water, and their inhabitants, in ways that would never meet naturally. For example, blacktip reef sharks have been found for the first time in the Mediterranean having originated in the Red Sea. Pacific nudibranchs are also arriving in the ballast water of ships in the Caribbean and Indo-Pacific Lionfish have invaded the Caribbean thanks to released aquarium subjects. These illegal aliens have the potential to severely disrupt their new home and the diversity that has evolved without them.

I was very pleased to see the energy that Wakatobi put into protecting their reefs. Great effort is made to educate and work with local communities to prevent destructive

practices such as dynamic or cyanide fishing on local reefs. In fact, much of the revenue from guests visiting the resort goes directly into local villages in payment for a strict no-fishing policy on fif-

teen miles of reef surrounding the resort. The extremely remote location, extraordinarily high biodiversity and conservation efforts in the area make this a safe haven for many species that are suffering

throughout the Coral Triangle.

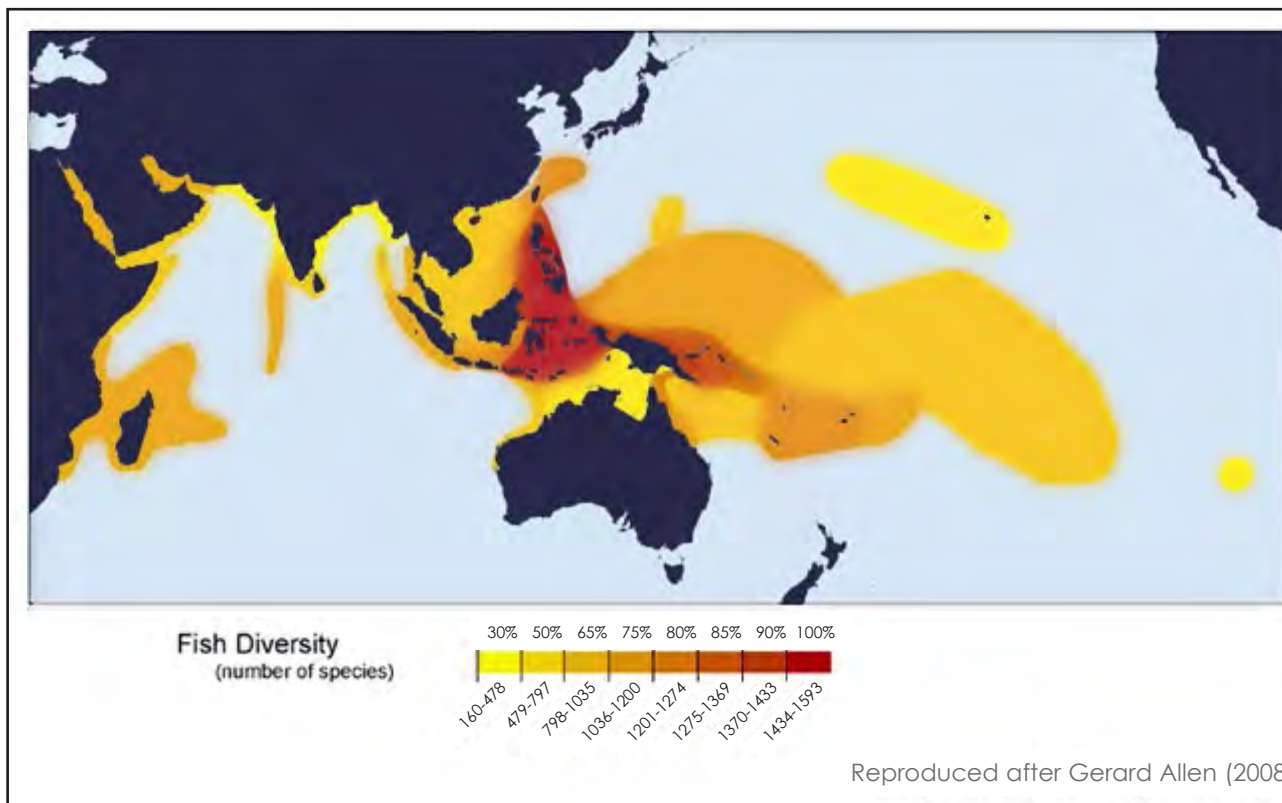
With very limited resources available to conservation efforts, the identification of regions that contain high species diversity or many endemic organisms may help

pinpoint areas of conservation priority. Scientific data indicates that the protection of South East Asian reefs will preserve the most species; however, there are also many other areas deserving of a conservation focus.

Richard Smith is a British marine biologist and photojournalist. As well as writing for many publications internationally, he leads marine life expeditions where the aim is for participants to get more from their diving and photography by learning about the marine environment: www.OceanRealmImages.com

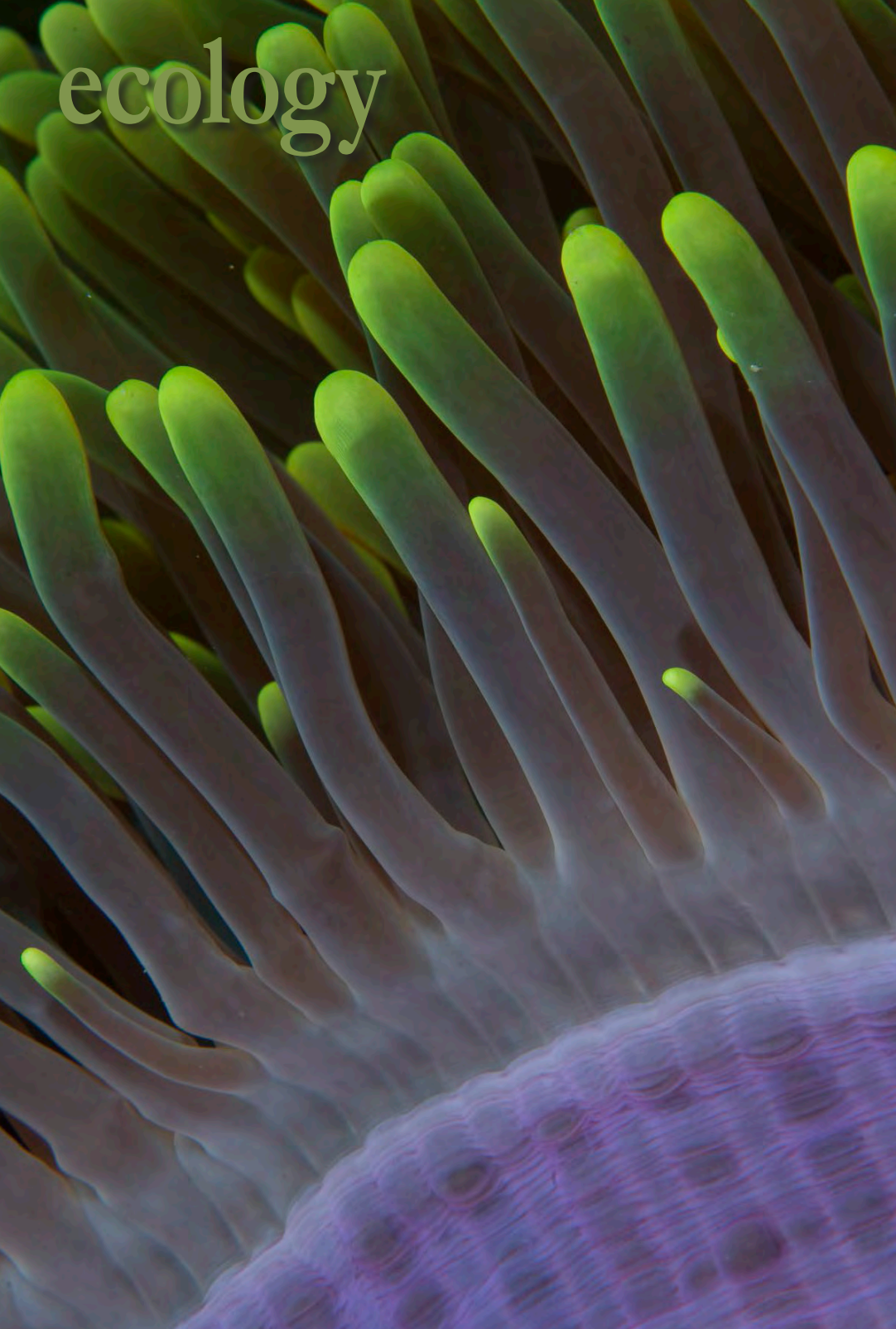
Biodiversity

Crinoid clingfish (left) are a small species found in small groups at the centre of feather stars. Small, cryptic species play a large role in the accumulation of the Coral Triangle's biodiversity; Scientifically described in 2007, *Kyonemichthys rumengani* (left center), is found only in the Coral Triangle



Reproduced after Gerard Allen (2008)





Detail of a magnificent anemone mantle

ABOUT WAKATOBI

The area commonly known as Wakatobi lies within the Tukang Besi island group, in Indonesia's Southeastern Sulawesi region. It is one of the most remote regions of Indonesia, and until recently, travel to this area required more than 24 hours from Bali by a com-

bination of small aircraft, overland and boat travel.

The title Wakatobi is an acronym derived from the first two letters in the names of the group's four major islands: Wangi Wangi, Kaledupa, Tomia and Binongko. These islands encompass some of the planet's most productive and

pristine reefs and coastal shallows.

Much of the island group lies within the Wakatobi National Park, which is the second largest in Indonesia. In 2012 this area was designated a UNESCO Marine Biosphere Reserve. In addition, a 20-kilometer section of reef is under the protection of the Wakatobi Marine Reserve, which is a private program administered through the Wakatobi Collaborative Reef Conservation Program.

This initiative was developed by the founders of Wakatobi Dive Resort to provide a proactive means of protecting the reefs and marine resources. Established in

1996, Wakatobi Dive Resort was the first operator to offer services for diving and snorkeling in this region. A portion of revenue generated from resort activity funds a lease system that pays area villagers and fishermen to honor a no-take policy on specific reef tracts. Since the program's implementation in 1998, environmentally damaging fishing practices have ceased, and the reefs have remained in near-pristine condition, with some showing marked improvement.

Underwater environment

The islands of Wakatobi are typically flanked by fringing barrier



Rare Denise's pygmy seahorse living in association with a whip coral colony

Divers investigate a rich coral reef in the Wakatobi region

reefs that drop to depths of 40 meters or more at distances of less than 100 meters from shore. There are also a number of offshore reef plateaus and sea mounds in the region that rise from the depths to create isolated areas of shallow habitat.

What sets Wakatobi apart from other venues in the region is the unmatched access divers, snorkelers and photographers have to the most promising sites, most of which begin in very shallow water. Additionally, finding many elusive, well-hidden creatures such as the pygmy seahorse, is made easier by Wakatobi's dive guides, aka dive experience managers, who are experts at locating most species in their natural environment.

The islands of Eastern Indonesia are surrounded by some of the most bio-diverse coral reefs on the planet. This region, known as the "coral triangle," is home to more than 450 varieties of hard and soft corals, 3,000-plus species of fish and several thousand more types of invertebrate animals. With literally thousands of species living in close quarters on Wakatobi's reefs and shallows, there is no one single animal that could be said to be the signature attraction for underwater identification and viewing. That said there are some

Biodiversity



that never fail to entertain or provide unique opportunities for fish watchers and photographers. A few of the interesting denizens of the reefs at Wakatobi include:

Sea turtles. Thanks in part to Wakatobi's turtle nursery program and other conservation efforts, area reefs and shallows hold extremely healthy populations of sea turtles such as the green turtle and hawksbill turtle.

Pygmy seahorses. Wakatobi provides an ideal environment for pygmy seahorses to thrive, and it was only recently that this group of tiny creatures became known to science; most significantly, four of the seven known species are regularly seen in Wakatobi, and were discovered nearby in the past decade. According to marine biologist Dr Richard Smith,



An uncommon nudibranch, *Noumea crocea*, on the reefs of Wakatobi

"Anyone who has the pleasure of watching one of these animals should consider themselves privileged, because they are seeing something that few humans will ever see. And when it comes to finding pygmies, there is no better place than Wakatobi to begin the hunt." Unlike their larger cousins, the pygmy seahorses live only on coral reefs, and in many cases on a single species of gorgonian sea fans, which are found in abundance on the reefs at Wakatobi.

Cuttlefish. With eight arms growing out of their heads, and three hearts pumping blue blood through their gelatinous bodies, cuttlefish may seem like creatures from another planet, but they actually thrive in abundant numbers on the reefs of Wakatobi. In particular, the broadclub cuttlefish is a very common sighting, and groups of sometimes a half dozen can be seen hunting in pack formation, with their mantles pulsing and flashing as they send visual messages back and forth.

Humphead parrotfish. One of the larger members of the parrotfish family, the humphead can be readily identified by the crest-shaped growth on its forehead. They are seen often at Wakatobi trave-

ling in large groups. Like other parrotfish, the humphead uses powerful incisors and pharyngeal teeth to grind up coral and algae-covered rocks; the organic matter is digested while the remaining inorganic material is excreted. While this may sound destructive, it is this processed "coral poop" that washes ashore to form beaches. A school of parrotfish can add tons of soft sand to a beach each year. These fish often travel in shoals of 50 or more, and can live to be 40 years old.

Mandarinfish. Normally shy, these brightly colored members of the dragonet family lose their inhibitions as the sun goes down. At dusk, the males leave the cover of the rocky shallows they typically inhabit to perform intricate courtship displays that highlight their brilliant coloration. When a male attracts the attention of a female, they pair up belly-to-belly and begin a spiraling dance upward in the water column, releasing egg and sperm simultaneously at the apex of their ascent.

Mantis shrimp. Growing up to 30cm in length and able to deliver a smashing blow with their raptorial claws that can shatter a crustacean's shell, the mantis

What is biodiversity ... really?

Text and photos by Peter Symes

Diversity is about numbers, so the more species present in a habitat, the greater the biodiversity, right? Not quite.

Diversity in a biological context is often confused with **richness**, which is a simple measure that quantifies how many species are present without taking their abundance into account.

Biodiversity is a more comprehensive measure that takes into account both the number of species and their relative abundance and distribution. As such it is both a

quantitative and qualitative measure consisting of two components: **species richness** and **species evenness**.

To use a more familiar example, consider the barley field shown below. It is essentially a mono-culture and the patchy presence of a few wild flowers does not make it a rich and varied habitat. Including the boundary with all the many different flowers does not quite make it either because the distribution remains very uneven (there is still so much more barley than flowers).

The same notions apply to the marine environment and what we as divers would like to encounter. Say, if we want to go look for mandarin fish, pygmy seahorses, rhinopias and other photogenic or exciting species, they not only need to be present at the location to which we are headed, but they also need to be not so exceedingly few and far apart that we have little chance to find them.

Measures and maths

So how does one go about an objective measure to biodiversity? A number of math-

ematical indices have been formulated, which in various ways gives weight to the proportional abundance of observed species. In its simplest form, species diversity can be calculated by taking the inverse of the weighted average of species proportional abundance.

A number of indices that put emphasis on different aspects of the diversity have, over time, been proposed and put to use. The Shannon index, which is derived from information theory formulated in the late 1940s, is probably the most popular. □



A barley field (left) has low biodiversity as the presences of a few other species of flower does not significantly alter the fact that the field is a mono-culture.

is one shrimp that deserves respect. The mantis are solitary borrowers, constructing elaborate tunnels into the rubble or sand strata of the sea floor. One of these animals' most distinctive features are the iridescent eyes, which not only move independently to provide 360-degree binocular vision, but also see in a wider spectrum of light than any other creature in nature, including UV and polarized light.

Frogfish. There are more than 15 spe-

cies of frogfish native to Wakatobi, and though they don't reveal themselves to the casual observer, divers and snorkelers who look closely may realize that what they first thought was a lump of rubble or a clump of sponge is actually a stealthy predator, lying in wait.

Crocodilefish. It is the distinctive snout and head that give the crocodile flatfish its moniker, but perhaps the most unusual feature of this ambush predator are the frilly iris lappets, which protrude over the

black pupils of their eyes to break up the one remaining pattern that might alert unwary prey. Like the namesake reptile, this fish will lay motionless for long periods of time, waiting patiently for the right moment to strike out.

There are many, many other marine creatures readily found on Wakatobi's reefs. Learn more by visiting Wakatobi's blog, Wakatobi Flow, at blog.wakatobi.com. □ SOURCE: WAKATOBI MEDIA INFORMATION

Stability and resilience in ecosystems

Text by Peter Symes

The transfer of food energy from the source in plants through herbivores to carnivores is commonly referred to as the **food chain**. The **trophic level** of an organism is the position it occupies in a food chain. Food chains start at trophic level 1 with primary producers such as plants such as phytoplankton, kelp or seagrasses, move to herbivores at level 2, predators at level 3 and typically finish with carnivores or apex predators at level 4 or 5. The path along the chain can form either a one-way flow or a **food web**.

The classification of organisms by trophic levels is one of function and not of species as such, and a given species may occupy more than one trophic level i.e. when they go through stages of development. Size has a big effect on the organization of food chains; Animals on successive tropic levels tend to get larger i.e. the shark, which is the top predator, is larger than the seal which is a carnivore that largely feeds on fish and marine invertebrates.

So, in a way, it seems like foodwebs tend to organize themselves into a pyramid-like structure with few and big individuals at the top, while there are myriads of both species and individuals on the lower trophic levels forming the base.

And the question is...

Ecological communities with higher biodiversity form more complex trophic paths, but does complex mean more stable societies? And what limits the size and complexity?



How much plankton is needed to make a shark... or two?

Energy sets limits

In food chains the energy moves from one trophic level to the next in what is called an **energy pyramid**. At the bottom of this pyramid, we have the 'primary producers', which largely are the photosynthesisers, plants and other organisms that convert the energy in sunlight to chemical energy that can later be released to fuel the organisms' activities. On the next levels, we typically subsequently have herbivores, carnivores and top predators.

The 10% limit

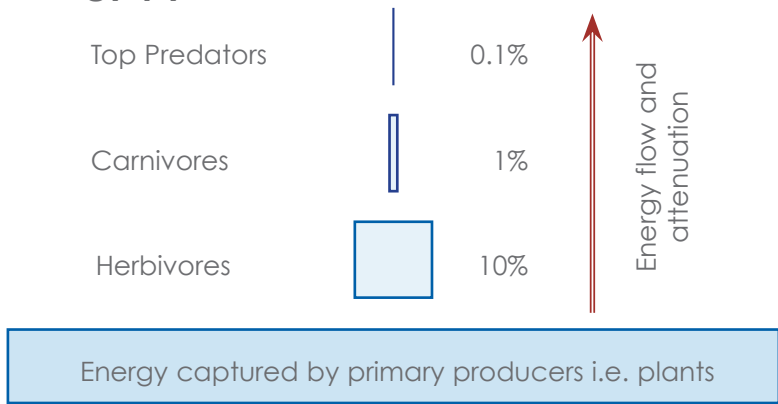
The efficiency with which energy or biomass is transferred from one

trophic level to the next is called the **ecological efficiency** and is no better than about ten percent on average. In other words, consumers on each level only convert about one tenth of the chemical energy in their food to their own organic tissue. This is also known as the 'ten percent law'. Since energy drops off so quickly by passing through the levels, it follows that food chains rarely extend for more than five or six levels before energy is depleted.

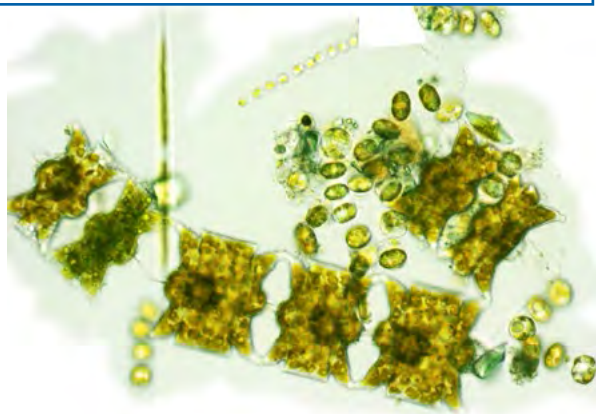
Since plants only convert about one percent of the sunlight they receive into chemical energy in the first place, of the total

energy originally present in the incident sunlight that is finally embodied in a tertiary consumer, say a shark in the ocean, is about 0.001%.

Energy pyramid



Simplified energy pyramid with four trophic levels showing the conversion and throughput of energy between levels. The energy can somewhat be correlated to biomass.



Stability does not follow complexity

Stability is a dynamic concept that refers to the ability of a system to bounce back from disturbances (a subject we previously treated in more detail in X-RAY MAG #17, p. 71, "**Why and how ecosystems change**").

For starters, the intuitive argument that increased stability follows increased community complexity in the food web was already countered in the 1970s when it was demonstrated that *complexity actually reduced stability in mathematical models*.

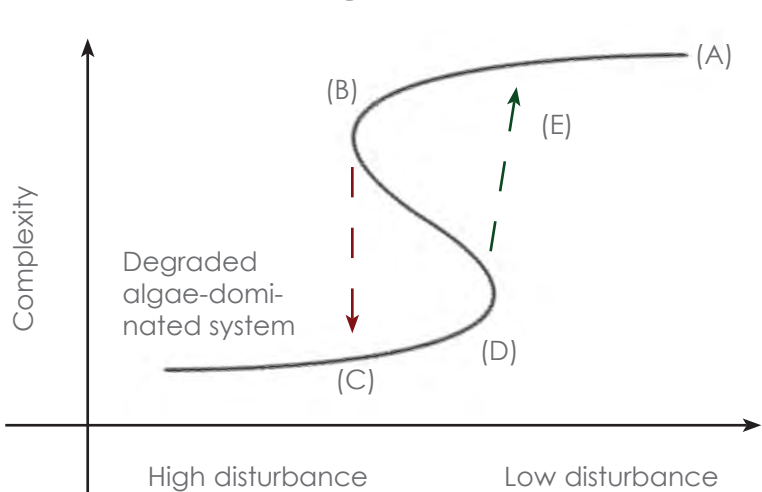
Where diversity does create stability or steady state scenarios in ecosystems, it follows from the establishment of enough equilibrium and buffer mechanisms in the assemblage of interacting species, which may or may not happen through non-random mechanisms.

Stability in complex systems is not a given. In fact, some systems are inherently unstable or chaotic and prone to crash, after which they will cease to exist and only the stable systems will prevail. Whether such systems are resilient to perturbations or fragile is another question.

Resilience

Resilience is a measure of the ability of the system to persist in the presence of perturbations arising from

Hysteresis and catastrophic change



When a healthy complex system such as a varied coral reef is subject to a disturbance, it will move along the gradient from (A) to a point (B) where a dramatic or catastrophic change occurs and the system collapses into one of lower complexity dropping down to point (C).

Reversing the collapse, or restoring the reef, however, takes a different path and often 'uphill' against some gradient or energy requirement. One has to, along with other restorative measures, also lower the disturbances, or cause, to at least level (D) after which it will eventually evolve back up to point (E). This curve also shows how different states can exist under the same conditions—when disturbance levels lie in the range between (B) and (D).

physical or chemical factors, climate or human activities such as fishing or pollution. Regulations on fisheries, for example, where outtake or harvest is limited is all about keeping the perturbations within 'sustainable limits'. Take only so much, and the resource will grow back. Take out too much, and the ecosystem may suffer a major collapse during which its overall structure and composition gets dramatically altered in a manner that is often impossible or very difficult to reverse.

Hysteresis

In an ecological context, hysteresis refers to the existence of different stable

states under the same variables or parameters.

A real-world example is helpful to illustrate the concept. Coral reef systems can dramatically shift from pristine coral-dominated systems to degraded algae-dominated systems when populations grazing on algae decline. While the shift in one direction takes one path, reversing the process will follow a different path often requiring a significant input of the driving force to facilitate the change.

In this case the disturbance or causing agent has to be reduced to a level much lower than it was when the dramatic shift occurred. □



Diver with very rare blue sea fan, *Acanthogorgia* sp., found below 45 metres depth, Gorontalo, Sulawesi, Indonesia

Scuba Confidential

What if Diving was New?

Text by Simon Pridmore
Photos by Steve Jones
Millionfish.com

Imagine scuba diving is a brand new sport. You hear about it for the first time when one of your friends tells you about a scuba experience she had recently on holiday and you think this sounds incredibly exciting.

After thinking about it for a long time, you decide you want to learn. You take lessons to improve your swimming and then you look online for a dive instructor. There are no dive centres in your town. You have never actually seen a dive centre. You will have to travel to a nearby island to learn.

You are the first person you know who has signed up for a scuba diving course. For the people of your parents' generation, even if they were aware that scuba diving existed, they would

never have considered it even remotely possible that they could learn to dive. Diving was something that navy personnel did. It was a professional activity, not a sport.

Now they know that you are going to become a diver, your friends are envious and your family are worried about you. You feel like you are embarking on an adventure that will change your life.

The first scuba divers

In the 1950s and 1960s this must have been how it was for the first sport divers in Europe and the United States where scuba diving as a leisure activity began. The baby boomers born in the States and Europe in the aftermath of the Second World War were the first people ever to go under water for fun. Before, everyone who had dived was doing a job and had

no time or inclination to take any notice of what was happening around him. Nor, before Cousteau and Gagnan

came up with the idea of the aqua-lung, did anyone have the opportunity to move around very far, tethered as they were to the surface.

Several free magazines have been published, featuring movie stars and pop idols as diving role models. The gurus and industry leaders here are in their 20's or 30's.

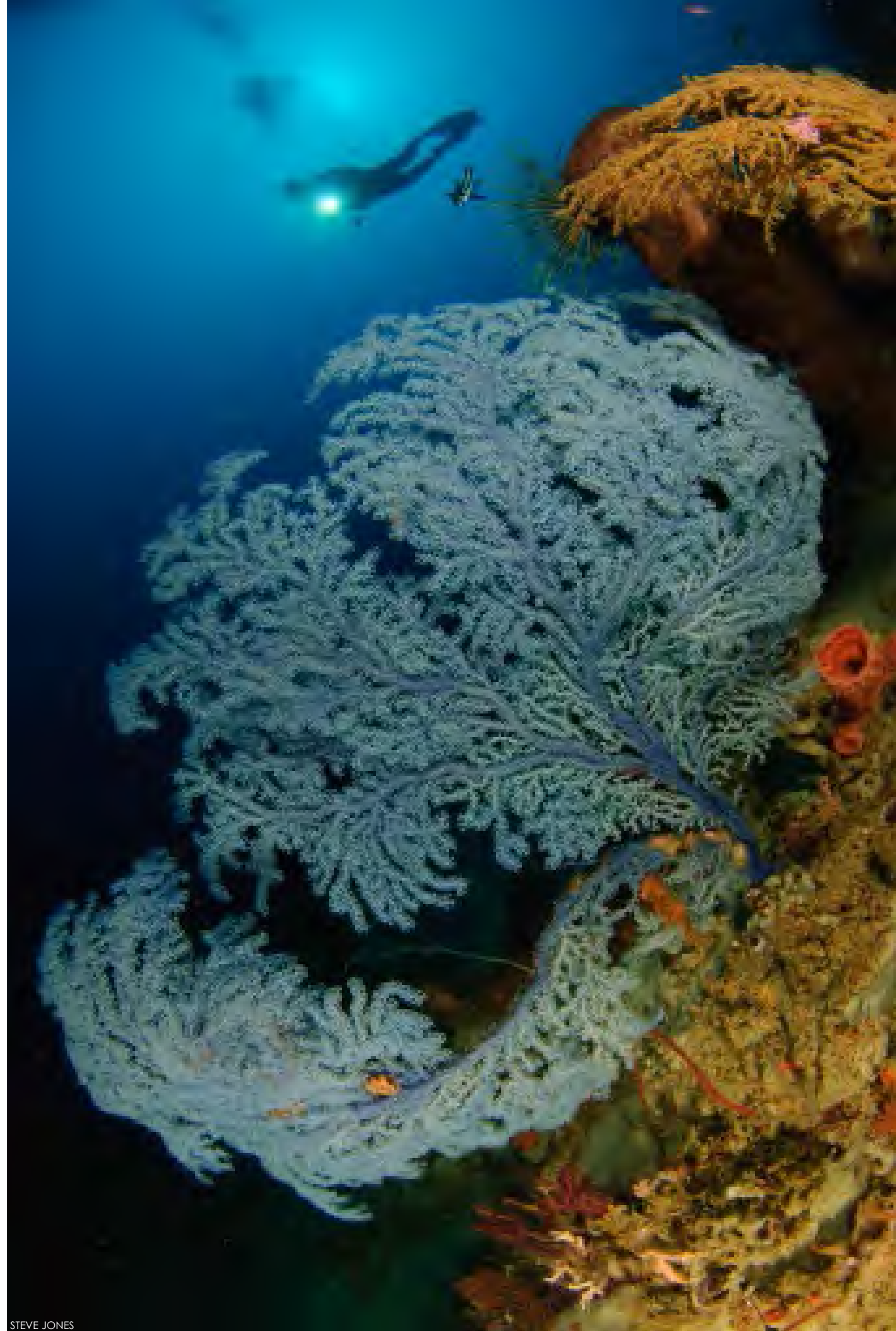
But in Indonesia, where we are fortunate to live, this is what is happening right now! People have been diving in Indonesia for decades but only recently have Indonesians themselves been diving here, other than as professional dive-masters and guides. For the first time, a generation of Indonesians has the economic security and free time to dive for fun.

Scuba is COOL!

The wonders of Indonesia's underwater world are now constantly featured in newspapers, magazines and television documentaries. Several free magazines have been published, featuring movie stars and pop idols as diving role models. The gurus and industry leaders here are in their 20's or 30's. Scuba is COOL!

My dive buddy and I visited a hotel on the Sunda coast a few months ago and were sitting by the pool in the

For the first time, a generation of Indonesians has the economic security and free time to dive for fun.



STEVE JONES



opinion

evening while a film unit was shooting scenes for one of Indonesia's most popular television soap operas.

One of the crew came over and asked what we were doing there and when we explained we were scuba divers, filming came to an abrupt halt and all the cast members, actors and actresses famous throughout the country, immediately surrounded us, asking questions about diving and saying how they were all planning to do courses. We felt like we were the stars!

World class diving — on your doorstep

How wonderful must it be to start diving and then discover that some of the best diving in the world is there right

on your doorstep? The vast majority of Indonesia's 170,000 plus islands lie in the coral triangle where two massive oceans, the Pacific and the Indian, join.

Places that people spend tens of thousands of dollars to visit for just a few days a year are easily accessible to you pretty much any time you want to go there. Do you fancy a long weekend in Komodo? You could leave work in Jakarta on Friday evening and be diving off Cannibal Rock the next morning. How about Christmas in Raja Ampat? Why wait until Christmas? There are overnight flights to Sorong from Jakarta every night of the week.

...it is wonderful to witness a whole society that is discovering the joys of dipping their heads below the surface of the sea for the first time.

Positive benefits

On a serious note the environmental and conservation consequences of so

many Indonesians learning to dive can only be positive. The country has an appalling conservation record on land and sea, with plenty of well-meaning laws protecting the environment but very little implementation or enforcement. A new generation of divers could well be a powerful force in turning the situation around.

Living in Indonesia and seeing scuba diving through the eyes of newcomers to the sport is refreshing. Coming from a part of the world where scuba diving is well established and it is taken for granted that almost anyone can dive if they want to, it is wonderful to witness a whole society that is discovering the joys of dipping their heads below the surface of the sea for the first time.

Comedian Dave Barry once wrote, "When you finally see what goes on underwater, you realize that you've been missing the whole point of the ocean. Staying on the surface all the time is like going to the circus and staring at the outside of the tent."

Welcome to the circus, Indonesia! □

Simon Pridmore has been part of the scuba diving scene in Asia, Europe and the United States (well, Guam) for the past 20 years or so. His latest book, also called Scuba Confidential, is available in paperback and e-Book on Amazon.

Diver and grand sea whip (right) and porcelain crab on anemone (below) in Gorontalo, Indonesia



STEVE JONES

STEVE JONES

Evie Dudas

For a West Chester woman, sunken ships meant treasure—and tragedy.

—The following is an article entitled “Sea Fever” previously published in AquaCorps Magazine, No. 1 February-March 1990.

Text by Cathie Cush
Photos courtesy of AquaCorps

As Evelyn Bartram Dudas’s *Nikonos III* made its way toward the bottom of the Atlantic Ocean one day not too long ago, she did the only thing that made sense to her at the time. She dove after it, retrieving the camera just before it was lost amidst the twisted remains of a shipwreck on the sea floor. Her rapid descent cost her a broken eardrum. It wasn’t the first time this veteran West Chester, Pennsylvania, diver, dive shop owner, and mother of four had suffered at the hands of the sea.

Evie Bartram learned to dive in 1964, while a student at the University of Buffalo. She thought it would give her and her boyfriend an activity to pursue together. The relationship didn’t work out. Heartbroken, Evie left school and

returned home. But she had found a new love.

After a short stint doing piecework in a machine shop and a summer back in Buffalo spent climbing mountains and diving instead of studying, Evie set sail on

a new course. When an opening arose at Aqua Terra, a Coatesville wetsuit company, she made scuba her business.

“They made very fine wetsuits, but they only made four sizes,” recalls the slender, energetic 44-year-old. “They didn’t fit

me, because I was about 5 feet 8-1/2 inches and skinny as a rail. I figured if I went to work for a manufacturer, I could learn to make myself a wetsuit that fits.”

Soon she was customizing suits for other divers—on the boss’s time—and saving for a Corvette. She and her colleague beau were racing to see who would be first to buy one of the flashy sports cars. He eventually was killed in his.

In the meantime, Evie joined Main Line Divers Club. She made her first ocean dive with them off Sea Isle City, New Jersey, in 1965.

“I was petrified to touch



the bottom. I didn’t know what starfish were; I didn’t know if they could hurt you,” she recounts.

She quickly overcame her apprehensions. By her third ocean dive, she was exploring the *Stolt Dagali*, a tanker that had been sheared in two in a collision the year before. The ship’s stern rests in 130 feet of water, rising to within 70 feet of the surface. In the gallery, Evie recovered several stainless steel pots, then discovered that her buddy was no longer with her. He had run out of air. She followed him to the surface, when he was apparently in the process of drowning.

“I had to drop all my goodies and tow him back to the boat,” she says. “At that point I decided that buddy-diving left a little to be desired. If you’re going to do any hardcore diving, you have to be self-sufficient.”

On another visit to the *Stolt*, Evie Bartram met John Dudas, a dive equipment manufacturer’s representative who became

her dive buddy for the next 17 years. Together they pioneered East Coast wreck diving, exploring the waters from New York to Maryland, and identifying the remains of several vessels that had sunk to the bottom years before. Today Evie’s home is full of artifacts she and John recovered from these virgin wrecks. Often they hitched rides on fishing charter boats, paying their fare with lobster they’d grab from the bottom. They taught scuba classes. She made wetsuits on her own now, and he repaired regulators. (She left Aqua Terra when they began making rainwear for use by troops in Vietnam).

In 1967, during a lecture to the Philadelphia Lion’s Club, Evie boasted that she would be the first woman to dive the Italian luxury liner *Andrea Doria*. Her prediction came true that summer, when she and Dudas joined an expedition to explore the celebrated shipwreck, which rests in 73 metres (240 feet) of water approximately 110 miles east of Long Island, New York. They returned with





the *Virginia*. It lay in deep water—50 metres (165 feet)—so a short dive was planned. After ten minutes the divers surfaced and swam to the ship's anchor line, down which they would descend to three metres (10 feet) to recompress—a technique that was common at the time. As Evie pulled herself down the line, her hands lost their strength and went numb. She was bent.

"My hands refused to grip; my feet refused to kick," she says. "I was becoming paralyzed. They rolled me on my back and I thought, 'if this is what it's like to die, this is not bad.' Then I just went unconscious."

John Dudas went at her side and



helped drag her back to the boat. Divers and crew fought heavy seas to pull her back on board, finally tying a rope around her waist and hoisting her up like a doll. She recalls lying in the wheelhouse wrapped in a blanket.

"I remember the suction of the mask being pulled off my face," she says. "I had vertigo, and I couldn't talk or see. I tried to scream, and I couldn't. And I remember being cold and hungry. It was a six-hour trip back to port."

That night she was taken to the hyperbaric chamber at Mt. Sinai Hospital, where her decompression sickness could be treated. The next morning, she found Dudas at her side, crying.

"That's when I figured out he cared about me," she adds softly.

After ten days the paralysis was gone, but it took a year and a half before the numbness in her arms and the vertigo left completely. In recent years she has



had post-diving bouts of vertigo and skin bends that last for hours. Still, she continues her 'hard-core' diving and shrugs at the mention of the risks she is taking.

"There's risk involved just driving to the

boat," she reminds a visitor pragmatically.

Evelyn Bartrum and John Dudas were married in 1970. They continued to dive together until pregnancy put a damp-

the compass and binnacle cover, a light fixture from over the wheelhouse chart table and a door handle. Dudas also recovered a porthole from the captain's room. Their 60-metre (200-foot) plus dive takes on a new dimension of drama when Evie explains matter-of-factly that the adventure was undertaken with the benefit of gauges to monitor tank air pressure and sans other safety equipment that today's divers take for granted.

In January 1968, tragedy struck when the pair took a Freeport, New York, fishing boat to a wreck known as





ener on her scuba activities, and shipwrecks took a back sea to a Girl Scout troop, Le Leche League, and other service work. By 1982, Evie was expecting for the fifth time (her firstborn died during childbirth), and she had been out of the water four years.

In July of that year, when Evie was several weeks pregnant, John dove the *Virginia* again. He never surfaced, and was found unconscious on the bottom with only 13 bar / 200 psi in his tanks. He had been on the bottom nearly 30 minutes when he was found, and would have required lengthy decompression before he surfaced. Evie will never

know for sure what happened that day on the sea floor.

If he suddenly realized he didn't have enough air to decompress, he might have panicked, she speculates, even though he had sufficient air to reach the surface. "He saw how badly bent I was after a ten-minute dive, and he did not want to be a vegetable, and I know of times when he passed out from stress."

The *Virginia*, as Evie recalls, was not a very interesting dive.

"I haven't been back," she says slowly, thoughtfully. "I'm not sure

emotionally I could handle it. Still, the curiosity is there."

Sitting in a classroom on the second floor of her dive shop, on a rainy winter day, she talks openly about the accidents and how they affected her life, about the trials of being a single mother, about guilt and misgivings, about plans for the future. When she recounts the events of John's death, it is as if talking about it will help her piece together the puzzle.

When John died, Evie was left with the beginnings of a business that she has nurtured into a successful full-time dive shop. When oth-

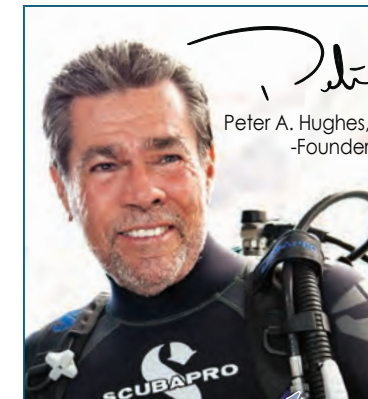


ers might have turned their backs on a pursuit that brought so much pain, Evelyn Bartram Dudas has plunged headlong back into the sea, accepting its risks and reaping its treasures. She does about 100 dives a year, which she says "is not a lot", but as long as they're on shipwrecks, she's happy.

"I've been finding more things," she says of her recent ventures into the sea. She's particularly proud of a brass lantern she discovered on a wreck last summer. Then she adds, "When I dove with John, I was still very much a beginner and he

would find something almost every time he went in the water. This is a man who wore corrective lenses—who was shot in the eye with an arrow when he was a child."

Perhaps this expert sea woman is still trying to be 'as good' a diver as her late husband. There are those in the diving community who say her deep diving practices are an attempt to join him. But maybe Evelyn Bartram-Dudas is only trying to retrieve some small tokens to replace the great treasure the sea has taken from her. □



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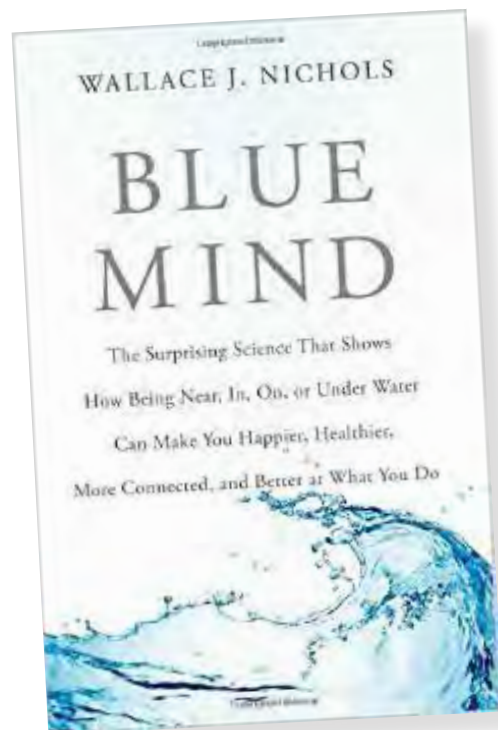
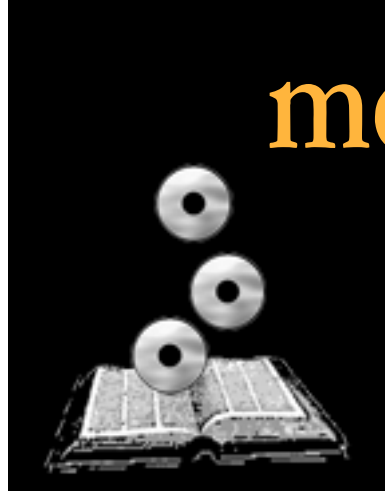
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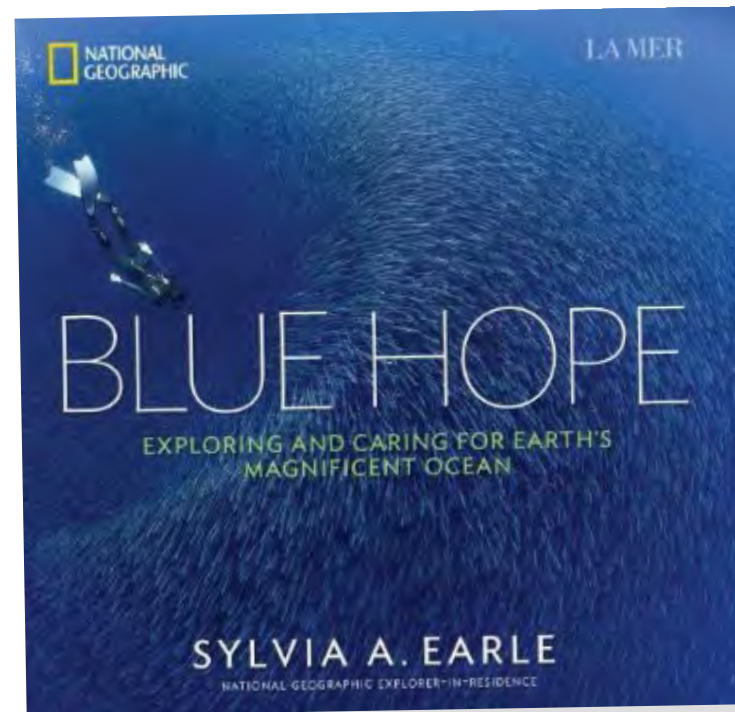


Water & Well-being

Blue Mind: The Surprising Science That Shows How Being Near, In, On, or Under Water Can Make You Happier, Healthier, More Connected, and Better at What You Do, by Wallace J. Nichols. Water is all around us—and within us. The land we stand on is surrounded

by a vast body of water, so much so that our planet appears blue when seen from outer space. The book explores how water can positively boost personal performance and well-being, while easing frayed nerves and anxieties. Written by marine biologist Wallace J Nichols, these claims are supported by cutting-edge scientific data and studies, and are combined with the anecdotal accounts of many individuals, from athletes and artists, to scientists and war veterans. On a larger scale, this book describes the author's philosophy pertaining to our relationship with water, relating it to the universal quest for a better life for all beings on our humble 'water marble'.

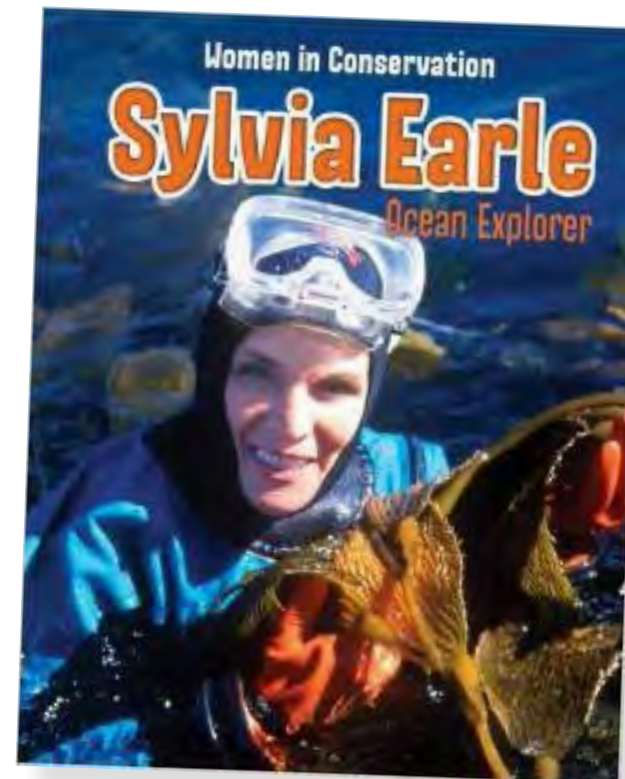
Hardcover: 352 pages
Publisher: Little, Brown and Company; 1st edition
Date: 22 July 2014
ISBN-10: 0316252085
ISBN-13: 978-0316252089



A Pioneer's Insights

Blue Hope: Exploring and Caring for Earth's Magnificent Ocean, by Sylvia A. Earle. This hardcover book is the latest publication by the acclaimed Dr Sylvia Earle. In 256 pages, it pays tribute to the beauty and magic of our world's oceans, and sheds light on its abundant gifts to the planet. Its seven essays convey the insights and inspirations of Dr Earle and other experts and celebrities, along with supporting facts, maps and stunning photos of beaches, coral reefs and marine life. Throughout the book, one clear and hopeful message resounds: Life depends on the ocean, and to save it, we must love it.

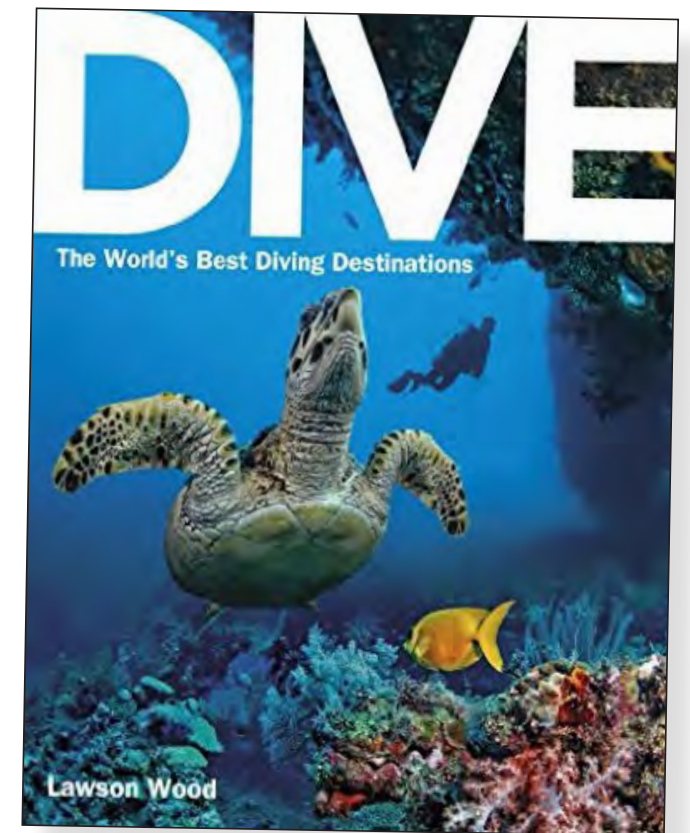
Hardcover: 256 pages
Publisher: National Geographic Society
Date: 19 Aug 2014
ISBN-10: 1426213956
ISBN-13: 978-1426213953



Her Deepness

Sylvia Earle: Ocean Explorer, by Dennis Fertig. This book is part of Heinemann InfoSearch's *Women in Conservation* series. This particular title features Dr Sylvia Earle and describes her efforts to protect the oceans. It covers her inspirations, discoveries and the impact of her work. At 48 pages, it serves as an introduction to the life of this remarkable lady. The fact that she is featured in this series alongside conservation greats as Jane Goodall, Dian Fossey and Rachel Carson speaks volumes about Dr Earle's achievements.

Hardcover: 48 pages
Publisher: Raintree
Date: 14 August 2014
ISBN-10: 140628338X
ISBN-13: 978-1406283389



Top Dive Spots

Dive: The World's Best Diving Destinations, by Lawson Wood. The title says it all. Written by a diver with more than 15,000 dives under his weight-belt, this book highlights over 250 of the best dive sites in the world. As a Fellow of the Royal Geographical Society and the co-founder of the Marine Conservation Society, author Lawson Wood had also founded Scotland's first marine reserve. Needless to say, the information contained within the covers comes from his personal experience and knowledge of the dive sites. Flipping through the book—with its photos depicting underwater scenery and wildlife—your wish-list of dive destinations is bound to generate more than a couple of new candidates.

Paperback: 192 pages
Publisher: Quercus Publishing Plc
Date: 4 September 2014
ISBN-10: 1782068562
ISBN-13: 978-1782068563



opinion

Diver on SMS
Brummer
wreck, Scapa
Flow, and
Red Arrows
(below) of
the Royal Air
Force, United
Kingdom

Text and photos
courtesy of Gareth Lock

A diver had an oxygen toxicity seizure because an incorrect gas was filled in a cylinder by a dive centre. A baby died because the wrong dose of medication was injected. Who is to blame for the error and how do we try to make sure that these types of incidents aren't repeated?

This is the second article in a series of six looking at a safety culture and its component parts, and focuses on a *just culture*, the aspect of a safety culture which underpins everything. Some of the readers may remember an article I wrote on this subject a couple of years ago, but this one will go into much more



Just Culture

— *It Underpins Everything*

depth and give examples of the issues faced in both the scuba diving community and other environments, which have more established safety management system programmes and cultures.

As a quick recap, a *safety culture* is made up of five component parts: a *just culture*, a *learning culture*, a *reporting culture*, an *informed culture*

and finally, a *flexible culture*. Each one contributes to the wider improvement in safety, and to a certain extent, without each piece of the jigsaw puzzle being in place, a safety culture will struggle to develop and survive.

Developing a safety culture is a pro-active process and needs to be led from the top down, although

pressures from below may influence the speed at which it is adopted and develops.

So what is a just culture?

Sounds like some wooly description which means that people can get away with anything, i.e. a 'no-blame' culture in which errors and poor behaviours are accepted as

the norm without recourse. This isn't the case. The Royal Air Force defines a just culture as "an atmosphere of trust where people are encouraged, and even rewarded, for providing safety related information and where it is clear to everyone what is acceptable and unacceptable behaviour" (www.maa.mod.uk/linkedfiles/regulation/manualofairsafety.pdf).





This document contains details of the safety management system in place within military aviation, including a slightly modified and more detailed version of the flow diagram (on the following page), which describes how errors, mistakes and violations are dealt with in terms of culpability and responsibility.

You may argue that an operational organisation which has millions of pounds of equipment and personnel to deal with and a very formal organisational structure within which to operate, has very little relevance to recreational diving.

I would argue there is considerable relevance, if only because the fact that there are regulations and a structure in place means it is easier to 'draw the line in the sand' as to what is right or wrong. However, as will be shown, the lack of clarity of right and wrong certainly makes it harder to deter-

mine how to deal with errors, mistakes and violations.

A just culture is a difficult concept to grasp for the majority of people because our society is developing into one in which we are always looking for someone to blame and that personal responsibility is diminishing. The following examples will hopefully put just culture into context and maybe adjust your perspective on 'right and wrong'.

Exhibit A. A nurse gave an eight-month baby which had been diagnosed with severe heart problems 1.4 grams of calcium chloride instead of the correct dose of 140 milligrams. It was the only serious medical mistake that she had ever made in her 24-year career. Overnight, she realised the mistake and reported it. Unfortunately, the baby died five days later.

There were a number of contrib-

utor factors: poor handwriting in the medical notes by the doctor; the staff were tired; there was a change of shift, so there was poor communication between staff; and then there was the general poor health of the baby. After the baby died, the nurse was escorted off the hospital site and then fired a few weeks later.

After a number of harrowing court cases in which she tried to defend her innocence, the nurse committed suicide. A nurse is only one part of a much wider system covering doctors, other nurses, shift pattern schedulers, and equipment designers and manufacturers.

Unfortunately, where to draw the line for accountability and responsibility is not clear, especially when a fatality is concerned.

Exhibit B. Now consider this incident. A dive centre was running two courses from the same

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Diver firing delayed surface marker buoy

Standards?

Interestingly, the majority of research and published literature looking at just culture considers the formal disciplinary or accountability approach in how to deal with the individual(s) or the group(s) that have made the mistake, error or violation. However, the majority of diving that takes place is done outside a formal organisational structure. Indeed, there are very few actual rules with the majority of the basis for 'safe diving practices' defined as guidelines or best practice.

Whilst diver training organisations do have their own standards which instructors have to adhere to, and national legislative bod-

ies like the Health and Safety Executive (HSE) in the United Kingdom have their legal regulations, these don't impact the majority of divers.

Indeed, in the UK, you could walk into a dive shop, buy a complete set of scuba equipment, fill the cylinders with air, and then go and dive to whatever depths you like without *any* training or certification.

Even though there is a national governing body (The British Sub Aqua Club—BSAC), they have no governance or authority over any of the other diver training organisations operating in the UK or any diver diving outside of a BSAC club-environment. Consequently,

REGULATION: a rule or directive made and maintained by an authority.

STANDARDS: an idea or thing used as a measure, norm or model in comparative evaluations.

RECOMMENDATIONS: a suggestion or proposal as to the best course of action, especially one put forward by an authoritative body.

GUIDELINES: advice or information aimed at resolving a problem or difficulty, especially as given by someone in authority. □

this means that the judgement of what is right or wrong is very

effect that you can determine whether an error or violation has taken place, and it is a subjective exercise when it comes to motivation.

Now back to the real world where there are significant shades of uncertainty and we are dealing with real people, some of whom may have been injured, how do we improve matters and create the environment where divers can talk about their mistakes, either anonymously or in public?

Barriers

We need to understand what the barriers are to preventing a just culture from developing.

Given the emotional roller-coaster we ride in the event of a serious incident or fatality, it is easy to see why it is difficult to discuss fatalities in an immature safe-

ty environment. Those involved are grieving for those who have been lost. There is a need or want to protect the dignity or reputation of those involved (even if they did make a silly mistake that cost them their lives). And finally, there is often a lack of detailed data to understand what happened and why.

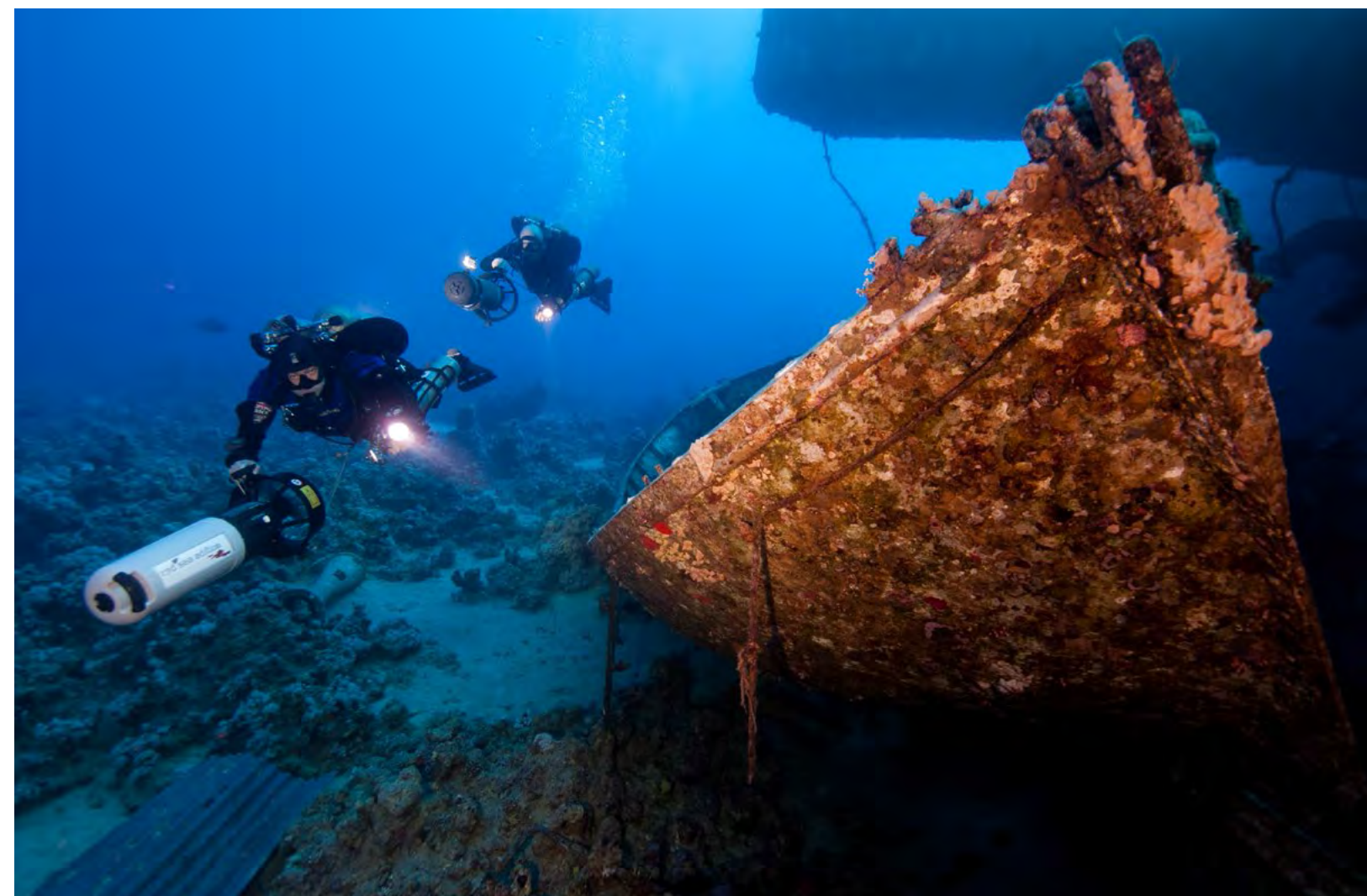
Lack of data creates uncertainty, which invariably leads to speculation. This is not useful when trying to determine lessons learned. Furthermore, the only person or people who really understood the decision-making process are no longer with us.

So, what prevents us from discussing non-fatal incidents when there are survivors and there isn't the same level of raw emotion as there is in a fatality?

I believe the following are all high up on the ladder of rea-

sons: emotion, fear, pride, the litigious nature of society, lack of structure or process to allow the other complimentary cultures to develop. Personal pride has been developed over time and the fear of its loss comes from the following linked factors:

- the majority of people don't like to discuss their personal failures,
- the majority of scuba training is delivered through positive reinforcement such that people are always told that they are great (even if they aren't), and
- there is significant personal investment in both terms of time and money, and people don't want to feel that that investment was wasted.



Divers on wreck of the MV Salem Express, Red Sea



opinion

difficult to define—even harder than the case of the nurse above.

Negative criticism

Unfortunately what sometimes occurs when incidents are published online in a public (non-anonymous) manner, is that they are dissected and criticised in terms of equipment configuration, training route or favoured training organisation, decompression profile, etc, in a negatively critical fashion rather than understand why the diver made the errors or decisions they did and address lessons that could be learned as a consequence.

This negative criticism appears to more vociferous if the 'incident'



diver in question doesn't conform to the respondents own 'norm', which ironically, could be a long way from best practice but they have 'always been done this way' and therefore must be right!

Fortunately over the last few years this attitude has started to be tempered but it is still prevalent in some quarters which reduces the opportunity to learn from others' mistakes.

In non-diving environments, punishment has legal or professional connotations, but in a recreational

activity, this could be personal or professional reputation and/or pride. This public criticism of detailed incidents is the "punishment" which needs to be managed with a just culture in sport diving. The matter is further complicated when instructors publicly talk about their incidents as this could be used against them in potential future cases where a dive did end up with fatal consequences.

Making diving safer

So how do we improve things to make diving safer? The first step is the normalisation of the reporting of incidents. An incident must not be seen as a failure, but rather it is an opportunity to learn. The stigmatisation of reporters must be recognised and reduced to give the confidence that others can report their incidents without fear of ridicule or negative criticism—people don't get up in the morning and decide

to make a string of mistakes that could (nearly) cost them their lives!

The reporting of mistakes and errors should be promoted throughout training, across the full range of diving from recreational through to advanced technical diving. This reporting shouldn't just be in the form of report forms to prevent litigation but to allow all to learn, and anonymous reporting systems outside of the organisation should be used if there is an issue with regards to stigmatisation.

Reporting should be considered the norm, not the exception and investment made to support such reporting systems as a consequence.

Secondly, the community needs to recognise that everyone's level of acceptable risk and specific configuration is unique (broadly) to them and will address feedback in that context. I have my views of what is acceptable or not, but

when I provide feedback on an incident and its causality, I couch it in terms of what that diver's likely knowledge, skill set, configuration and culture is, rather than my views.

We are always learning, irrespective of our experience, skill set and knowledge. However, the ability to learn from others' mistakes can only happen when those mistakes (and their mitigations or strategies) are exposed in a manner which promotes honesty and prevents negative criticism; that is what a just culture is about. □

Gareth Lock is an accomplished technical diver based in the United Kingdom. Currently serving in the Royal Air Force, Lock is undertaking a part-time PhD examining the role of human factors in scuba diving incidents. For more information, visit the Cognitas Incident Research & Management website at: Cognitasresearch.wordpress.com



Just Culture



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New species of dolphin discovered near Australia

Scientists examining a taxonomically confused group of marine mammals have officially named a species new to science: the Australian humpback dolphin, *Sousa sahalensis*.

The process of describing a species new to science requires a systematic analysis of all species most closely related to the animal in question.

The humpback dolphins in particular have vexed researchers and taxonomists for decades until researchers from the Wildlife Conservation Society and a number of other institutions provided the most definitive results in late 2013.

The Australian humpback dolphin species joins the current assemblage of three other closely related species: the Atlantic humpback dol-

phin (*Sousa teuszii*), the Indo-Pacific humpback dolphin (*Sousa chinensis*), and the Indian Ocean humpback dolphin (*Sousa plumbea*).

Aside from slight differences in overall length, number of teeth and vertebrae, and geographic distribution, the Australian humpback dolphin differs in appearance from the other three humpback species. Its dorsal fin is lower and more wide-based than the dorsal fins of *Sousa teuszii* and *S. plumbea*, and its coloration is dark gray, as opposed to the distinctly white (often with a pink tinge) coloration of its closest humpback neighbor, *Sousa chinensis*. The Australian humpback dolphin also possesses a distinctive dark dorsal "cape." □ SOURCE: WCS.ORG



R.L. PITMAN PROVIDED VIA NEWSWIRE

The Australian humpback dolphin (*Sousa sahalensis*) is a species of humpback dolphin and the fourth recognized humpback dolphin species chronologically

Humpback Fluke ID project needs your help

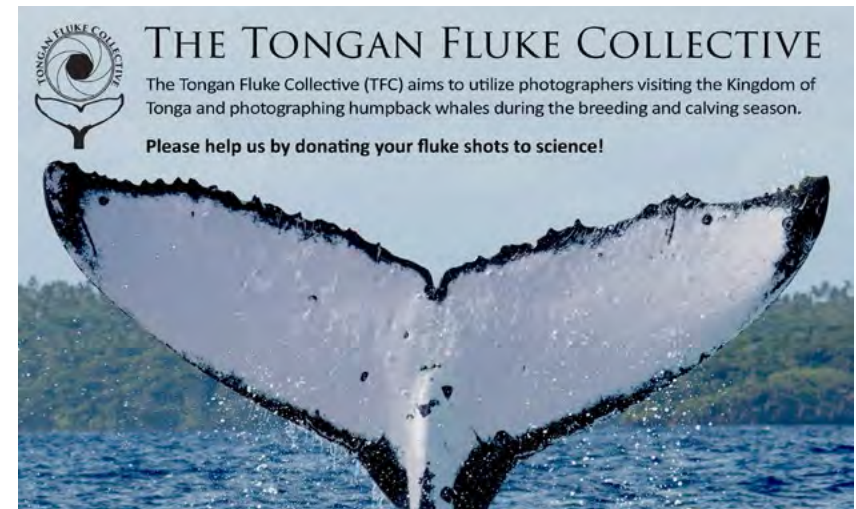
The Tongan Fluke Collective (TFC) aims to utilize photographers visiting the Kingdom of Tonga and photographing humpback whales during the breeding and calving season to compile a database of fluke shots for scientific purposes.

As a photographer who is visiting or has previously been to Tonga, you can assist by donating your whale fluke photos to the TFC.

All fluke shots will be credited to the photographer, but they will be sharing these with the scientific community and making them freely available to any researcher or organisation that would not normally have access to such resources.

Step 1: Upload to dropbox and share the link with them at scott.portelli@gmail.com or send them your email address and they will add you to the shared dropbox folder <http://www.dropbox.com/TongaFlukeID>

If you are already collecting fluke shots from Tonga and have a website, flickr group or FB page where you are housing these, then simply send them the link and they can download from there.



Step 2: They upload your photos to their flickr group and credit the photographer. All EXIF data from the image will be captured so you don't have to do anything. □

Find out more at: www.facebook.com/groups/tonganflukecollective

Blue whales often cross shipping lanes

The endangered blue whale population has been slow to recover since they were protected in the 1960s. Scientists suggest that one reason may be ship strikes that injure or even kill whales.

To better understand where important whale habitat and shipping lanes overlap along the U.S. West Coast, scientists attached satellite tags to 171 whales off the coast of California during summer and early fall from 1993 to 2008.

The authors analyzed the whales' paths within 200 nautical miles of the coast, and based on their distribution identified areas of highest usage by the whales.

Travel distance and ranges of individual whales varied dramatically, but blue whales consistently used similar feeding grounds each year despite different ocean condi-

tions, like El Niño and La Niña. The two most heavily used areas were in the Gulf of the Farallones, off central California, and the western part of the Channel Islands in southern California.

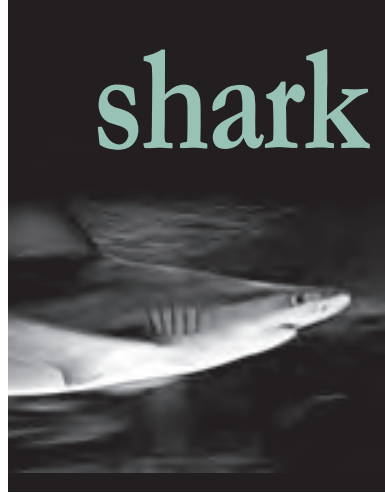
The timing of blue whale presence in U.S. waters is important information for managers trying to estimate the likelihood of human-whale interactions.

The authors report a high overlap between the areas heavily used by tagged blue whales and busy shipping lanes leading to major U.S. ports, and suggest possible modifications to ship routing aimed at reducing the likelihood of collisions with whales. □ SOURCE: PLOS ONE



Blue Whale, Southern California, 13 July 2014





Aerial
view of
Malapascua
Island in the
Philippines

Text and photos by Kurt Amsler

The fox shark, also called the common thresher shark, lives usually at depths of over 200 meters and it is sighted only rarely. This is the main reason, we don't know very much about these animals, and there is very little good visual documentation showing thresher sharks up close on camera.

If there is a place where there is the greatest opportunity to meet the great pelagic thresher shark, it is the island Malapascua in the Philippines, about 7km east of Cebu. Here, at a depth of 20 to 25 meters, one can catch a glimpse of these elusive sharks on a plateau of a sunken island named Monad Shoal.

Attracted by several cleaning stations, the sharks come regularly before sunset for their early morning "toilette". They are cleaned by the small cleaner wrasse that clean the sharks' skin, gills and even inside their mouths of parasites, bacteria and food debris.

Due to this behavior, it also makes it necessary for observers to be there on time as well, because it is the only chance to see and approach this shark to photograph it.



Photographing threshers

For a week now, I'd been getting up at 04:30 each morning in order to get some good shots of a thresher shark. On each dive at the Plateau I site, I saw some of them in the distance, but due to bad visi-

bility, pictures taken were blurred.

I wanted to get photographs in which the image of the animal was sharp and had good contrast, but this required that there be not more than two meters between shark and photographer—as

well as lots of luck! But patience and perseverance is a prerequisite for a wildlife photographer.

So now, I found myself again swimming confidently through the dim twilight to the edge of the plateau. Today, we'd try

a different spot, a place deeper and further away than the previous ones. Down there we would remain for 60 to 70 minutes, motionless and observing the blue-green horizon for the distinctive silhouette of the thresher shark.





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Thresher Sharks



Thresher shark with cleaner wrasse on mouth

We were located right on a steep wall dropping to over 200 meters below us. But instead of sharks appearing, just swells of very cold water arrived from the depths below. I wished I'd had a few more millimeters of neoprene on my body.

Already 50 minutes had passed, and thanks to nitrox 40/60, we were still good on bottom time. Around us, it was noticeably brighter now. I was still hopeful and set the camera to these

new light conditions—to be prepared just in case.

But now something seemed to be happening in the blue-green infinity—a dark shadow appeared, still hazy but slowly more and more clear. Suddenly a huge, approximately four-meter thresher swam right up to me!

Rushing adrenaline replaced, within seconds, the chill of the morning—certainly not for fear of the sharks, but

rather the pressure not make any mistakes, either technically or behaviorally, and risk losing this incredible chance. But the old routine came flowing back after a few seconds, and I followed all the action through the viewfinder of my camera.

The shark approached slowly but surely. Then suddenly, something strange happened. In less than three meters off camera, with its pectoral fins laterally turned, the shark stopped





shark tales

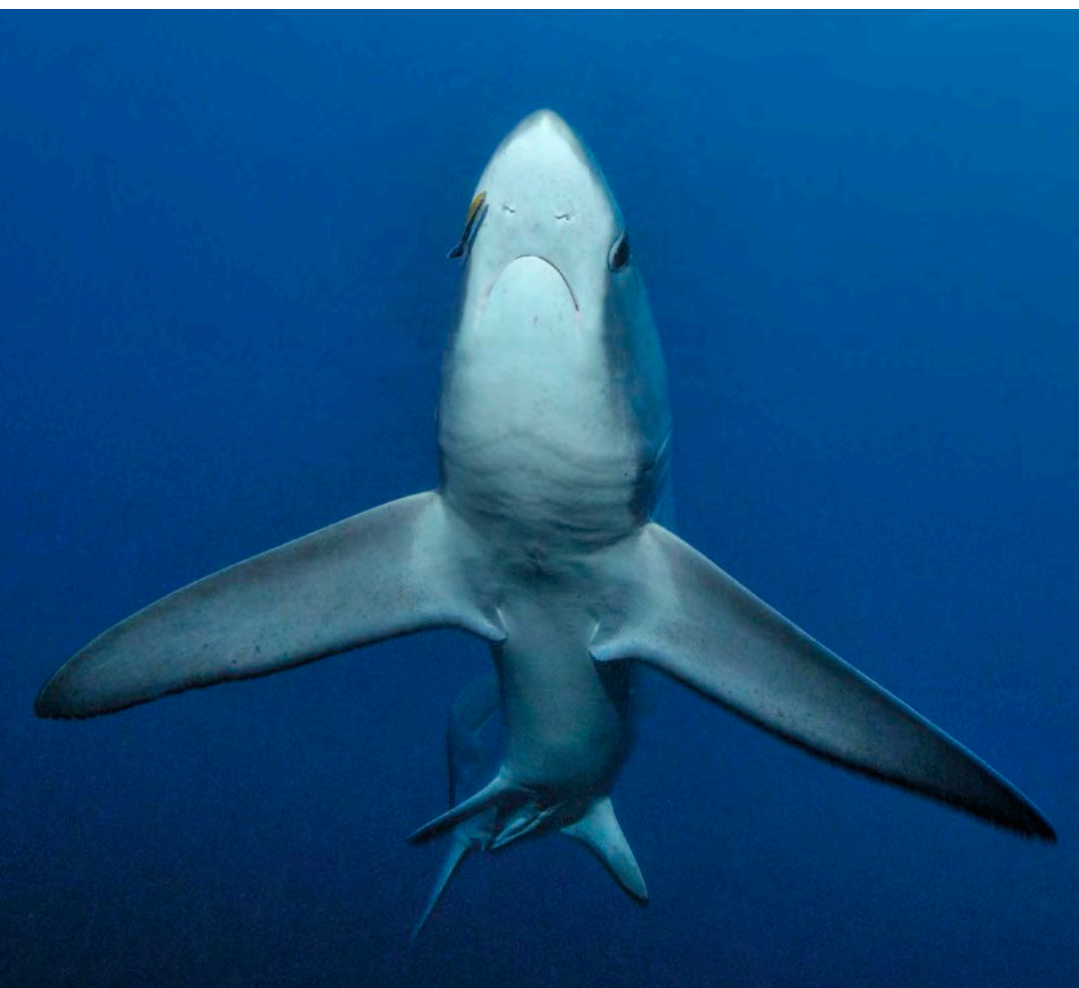
THIS PAGE: Scenes from early morning dives with thresher sharks at Monad Shoal off Malapascua Island in the Philippines

abruptly and remained almost motionless for a split second right in front of me—I pull the trigger!

I prayed to all the gods of the Philippines that the shark would not back off and disappear, never to return again. Fortunately, this was not the case. Then, almost from a still stop, the shark suddenly shot past me, over me and turned 180 degrees around, only to disappear to whence he had come.

During the whole shark encounter, I wasn't breathing at all—and for good reason—but now I had to rinse out my lungs with such vigor that all the fishes, and I guess also all the sharks, in the area escaped in a panik. But by now I didn't care—I had the "Thresher" in my box! Tomorrow I could sleep longer. □

For more information, please visit Kurt Amsler's website at: www.photosub.com



THRESHER SHARK FACTS

CLASSIFICATION:

Kingdom: Animalia
Phylum: Chordata
Class: Chondrichthyes
Subclass: Elasmobranchii
Superorder: Selachimorpha
Order: Lamniformes
Family: Alopiidae
Genus: *Alopias*

GENERAL DESCRIPTION

The thresher shark is of the order Lamniformes (or mackerel sharks) with a tail fin that has a greatly elongated upper lobe. They are very strong swimmers that can vault completely out of the water. Threshers have a countershaded body—dark blue-gray above and white underneath. The thresher shark has small jaws, but can use its tail to corral and even kill fish. The first dorsal fin is much,

much bigger than the second; the pectoral fins are curved. Like other mackerel sharks, it has an anal fin, five gill slits, two dorsal fins, no fin spines, a mouth behind the eyes and no nictitating eyelids. It is mostly nocturnal (active at night).

SIZE: 16.5-20 ft (5-6m) long

HABITAT AND DISTRIBUTION: The common thresher shark swims from the surface to a depth of about 1,150ft (350m). It lives in open tropical and temperate waters, including the eastern and western Atlantic, the central Pacific and the Indo-west Pacific.

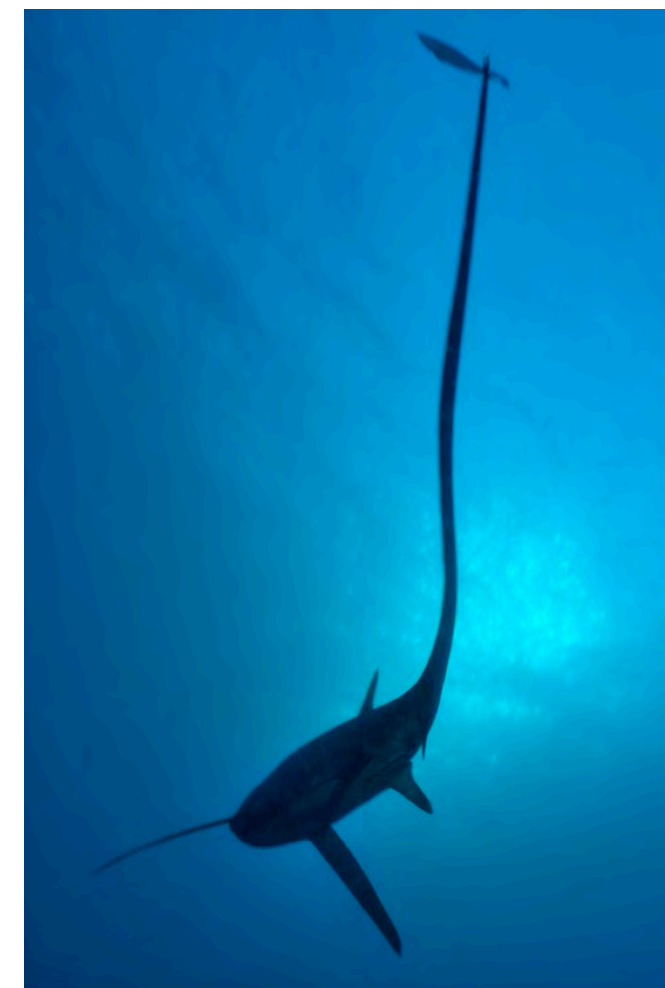
TEETH AND DIET: The thresher shark eats squid and fish, corraling them with its elongated tail, stunning them with slaps from it, and catching

them with its very sharp (but small) teeth.

SPEED AND SWIMMING: They are very strong swimmers and can even leap out of the water.

REPRODUCTION: Threshers reproduce via aplacental viviparity; the eggs hatch inside the female. The developing embryos are ovophagous; they will eat smaller, weaker siblings while in the womb. Mature females (at least 10ft or 3m long) have litters of 4-6 pups, bearing live young. These pups are 3.5-5ft (1.1-1.5m) long at birth.

POPULATIONS: Threshers are decreasing in numbers because of overfishing; they are hunted for their meat and fins. □ SOURCE: WIKIPEDIA





Edited by Ila France Porcher

THIS PAGE:
Demonstrators
opposing the
shark cull in
Australia

Three hundred one scientists criticise Australian shark cull

Text by Ila France Porcher
Photos by Tanya Izzard

Scientists from 20 Australian Universities and international institutions made a joint submission to the Western Australia Environmental Protection Authority, rejecting the scientific grounds for continuing the proposed three-year programme to cull sharks.

The programme was launched after an unusual number of fatal shark bites—seven between August 2010 and November 2013. Western Australia's premier, Colin Barnett, responded by ordering that baited hooks be strung from floating drums near recreational and beach areas, and that any great white, tiger shark, or bull shark caught be shot if it exceeded three metres in length.

Barnett was photographed clutching a large shark hook as the programme began, vowing that he had an "overriding responsibility to protect the people of Western Australia."

Amid great controversy and crowds, which flocked to the beaches to protest the killing, drum lines trailing the huge baited hooks were set up, and more than 170 sharks were fished. Those over three metres were shot, and the rest "released," yet it is unlikely that many survived the brutal treatment.

Further, not one great white shark, the species responsible for most incidents, was caught.

Drum lines and discord

The intense public outrage reflects the growing public concern about the plight of sharks, even in the country in which most fatal shark bites occur.

Yet in spite of the anger of the very surfers and swimmers that the slaughter was designed to protect, and the growing pool of scientific evidence that the presence of baited hooks has no effect on the activities of sharks, except to attract them closer to shore, the government intends to continue the programme for three more years.

Professor Jessica Meeuwig from the University of Western Australia, was the coordinating scientist for the submission. She explains:

"Given the lack of demonstrated safety benefits of drum lines, the uncertainties around the impacts of a cull on threatened and ecologically important marine

wildlife, and the ecosystems they inhabit, and given the availability of immediately applicable, proven, non-lethal alternatives, we don't need to resort to a 1960s-style lethal response to achieve safety outcomes.

To have over 300 researchers, including some of the world's top shark specialists and marine ecologists, all strongly agreeing that there is no scientific basis for the lethal drum-line programme, tells you how unjustified the government's proposal is. If the EPA and the Federal Minister for the Environment are using science for decisions, the drum-line proposal should not be approved."

Dr Christopher Neff from the University of Sydney stated: "There is no evidence that drum lines alone reduce shark bites. The Western Australia EPA now faces a question of science versus politics with global implications, because it is considering establishing a new international norm that would allow for the killing of protected white sharks."

The drum lines are ineffective and indiscriminate, the scientists affirm, with

78 percent of the sharks captured not considered 'threatening' to humans. Yet, scientifically supported, non-lethal alternatives such as the South African 'Shark Spotter' and Brazil's 'Tag and Remove' programmes were not assessed as viable options for Western Australia. Evidence from hook-based programs in Hawaii and Queensland that have been shown to be ineffective in reducing shark attacks on humans were ignored.

Dr Fred Whoriskey from Dalhousie University (Canada) and Executive Director of the global Ocean Tracking Network (OTN) that includes over 400 scientists from 15 countries, said:

"The OTN has protested the cull because it makes the oceans less safe. The cull undermines white shark research programs that provide the fundamental understanding of the behaviour of these animals that is key to guiding ocean-safety strategies."

Skewing the evidence

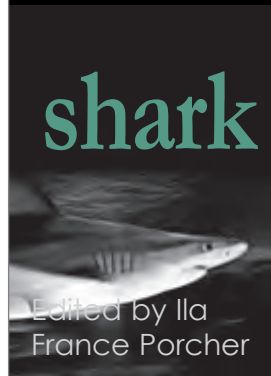
The experts are also concerned that potential impacts on protected and



TANYA IZZARD

TANYA IZZARD





shark tales

Edited by Ila France Porcher

threatened species are poorly evaluated, and ignore uncertainty, population biology, and the best available, peer-reviewed estimates of population size. Instead, the government is relying on its own internal estimates.

University of Queensland Principal Research Fellow Jennifer Ovenden challenged the science of the Western Australian Government submission. The government accepted the results of her two-year, peer-reviewed study identifying separate white shark populations on the east and west coasts, but ignored the estimated numbers of animals in her study.

She stated, "I think it's unprofessional because they are making inferences from inappropriate data sources using computer models. I think it would have been prudent to include our mature individual estimates in at least one computer model."

Negative impacts

Negative impacts on the wider marine ecosystem and World Heritage Areas were dismissed with little justification, ignoring existing scientific knowledge on the role that sharks play in maintaining ecosystem health.

Professor Mike Heithaus from Florida International University said, "More than 15 years of research on the ecological importance of tiger sharks in Western Australian waters has shown that these animals—espe-



cially the large individuals targeted by the cull—play a critical role in the major seagrass ecosystems that provide immense benefits to people in Western Australia. The loss of tiger sharks could destabilize the system and negatively impact ocean health and economic benefits."

Prof Bob Costanza, an internationally respected ecological economist from the Australian National University said:

"Marine ecosystems provide a range of valuable services to humanity. Removing apex predators from these systems can have unintended ecological and economic costs that far outweigh any real or perceived benefits."

Noting the important role that Australia plays in global leadership for the oceans, Dr Elliott Norse, Founder and Chief Scien-

tist of the Marine Conservation Institute (USA) asked:

"How can a country be a leader when it comes to saving whales in Antarctica, but kill threatened sharks in Western Australia? It is a step backwards at a time when a growing list of countries is moving to protect larger areas of our oceans, in part to protect these mobile large predators, as has recently occurred in the United States with President Obama's announcement of a greatly expanded Pacific Remote Islands Marine National Monument."

The scientific consensus from 301 experts categorically condemns the ineffective and dangerous policy of killing sharks in Western Australia. □

SOURCE: PRESS RELEASE BY DR CHRISTOPHER L. NEFF, PROF. JESSICA MEEUWIG

An Oceanic Time Bomb

Text by Ila France Porcher

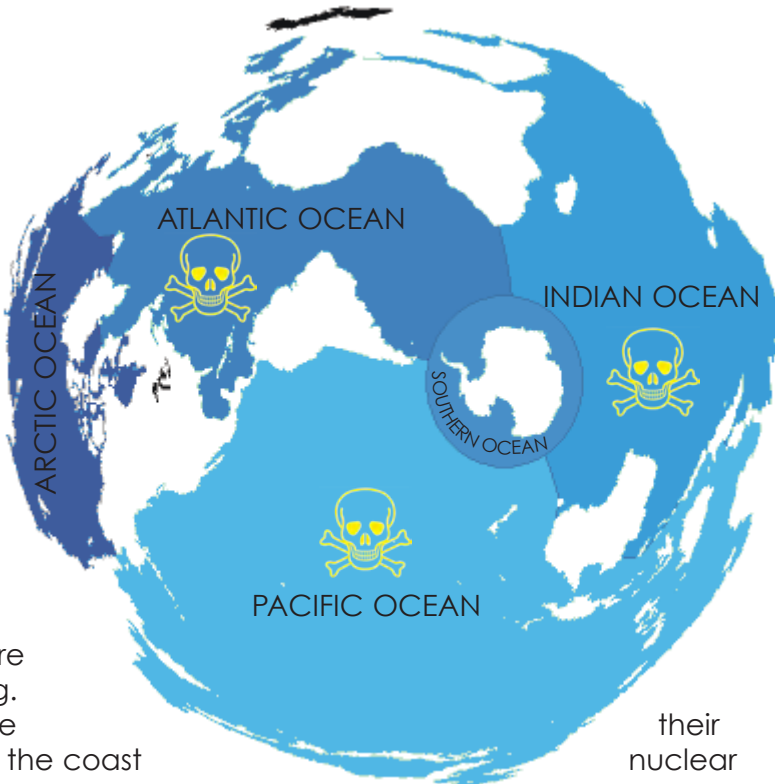
Governments and industries around the globe have been using the oceans to dispose of the hazardous and toxic wastes that became a problem on land. With an out-of-sight, out-of-mind attitude, the most hazardous and toxic constituents ever created have been dumped off shore rather than recycled, or elementalized into benign elements. This has been done globally, often secretly, often carelessly, often without keeping records, so that now, the actual locations of the dump sites are in most cases unknown.

This massive hazardous waste disposal has been going on for centuries, but it has dramatically increased in volume and toxicity in recent decades. Since the Second World War, radioactive

waste has been added to the toxic pile, and in many cases these barrels are already leaking. Such barrels are washing up on the coast of Somalia, and are known to lie off San Francisco and in the English Channel as well as other locations. Adding to the problem are pipes in Sellafield, United Kingdom, and La Hague, France, which simply carry radioactive waste from nuclear plants directly into the ocean; nuclear submarines that have been accidentally lost still lie on the floor of the north Atlantic Ocean,

their nuclear reactors still in place.

War munitions have also been dumped in unexpected quantities in oceans around the world, most of them off the coasts of the United States and Europe. The quantities in many cases involve hundreds of thousands of tons of toxic chemicals. Some of these were accurately recorded, but many were not.

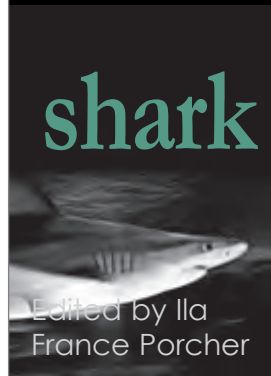


Tiger shark (file photo)

QUIZMODO / WIKIMEDIA COMMONS

ILA FRANCE PORCHER





shark tales

Edited by Ila
France Porcher

THIS PAGE:
Gray reef
sharks (file
photos)

For the locations of known sites see: **Chemical Weapon Munitions Dumped at Sea** (videolink).

Secret and under-reported

While the more dramatic pollution accidents, such as Fukushima, gain attention in the media, some experts feel that it is the secret and under-reported disposal of radioactive waste and other toxins that is more dangerous, and now threaten the oceans' capacity to adequately dilute it.

Yet, this aspect of oceanic pollution is under-reported, and difficult to research, in spite of

growing concern about marine health. All life originated in the oceans, and water forms the basis of life. The system through which water circulates by evaporating from the oceans, falling as rain, running into rivers, and flowing back to the oceans, is the key life-supporting system of our planet, and the oceans furnish about 80 percent of the oxygen in our atmosphere.

Threatened species

The oceanic ecosystems fringing the land, where the sun penetrates to the seafloor

and supports the rich communities we visit by diving, are particularly threatened. Those shallow waters along the shores and on the continental shelves, are home to a high fraction of oceanic life, and it is in these regions that many shark species have established nurseries, or pupping grounds. They, along with countless other species that depend on the shallows for part of their life-span, are most threatened by possible future leaks. Heavy concentrations of hazardous waste roll into the shore in waves, concentrate along the

shorelines, and poison them.

The barrels of hazardous, toxic, and radioactive waste lying off shore constitute a ticking time bomb. Government and industry did not know what to do with such hazardous compounds when they created them, and now the effect on oceanic life as a result of their irresponsible practice is not known. But, they are in our water system, and when this bomb goes off, it may well bring about the planet's worst progressive extinction cascade so far.

Clean-up technology exists, unused

Yet, the technology required to locate, retrieve, and clean up these sites is available! It has been found by industry and government, but the willpower necessary to address the problem will not arise

as long as the public remains unaware of the full extent of the problem, and fails to demand action. Information regarding local areas needs to be brought to the attention of the appropriate authorities, so that the necessary processes can be set in motion to finally clean the mess up. □

Ila France Porcher, author of The Shark Sessions, is an ethologist who focused on the study of reef sharks after she moved to Tahiti in 1995. Her observations, which are the first of their kind, have yielded valuable details about their lives, including their reproductive cycle, social biology, population structure, daily behaviour patterns, roaming tendencies and cognitive abilities. Her next book, On the Ethology of Reef Sharks, will soon be released.



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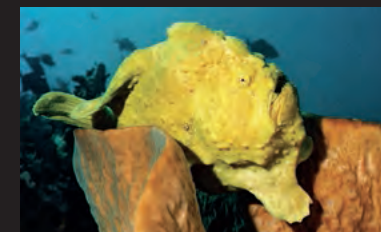
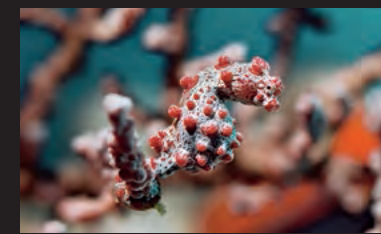
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The Philippine's
Malapascua Island

Text and photos by Andy Murch

— *Where Thresher Sharks Roam*



Enchanting Malapascua—the view from the private beach at Tepanee Resort



Malapascua

PREVIOUS PAGE: Thresher shark at Monad Shoal; Diver and soft corals at Gato Island (above)

As picture perfect as Malapascua is, in a nation of 7,107 palm tree fringed islands, 2.5km long Malapascua wouldn't be on anyone's radar were it not for the thresher sharks that treat the island like a spa. Each morning as the sun peeks over the mountains on distant Cebu, Pelagic threshers rise from the depths to be cleaned by reef fish along a deep ledge known as Monad Shoal.

When my plane touched down in Cebu City in the central Philippines, the ground had barely stopped shaking from a catastrophic earthquake that rocked

Bohol and Cebu causing severe property damage and loss of life. From the media reports that I saw en route, I was expecting total chaos, but Filipinos are used to the occasional quake and no one that I met seemed particularly phased by the tremor that registered 7.2 on the Richter scale. When I reached Malapascua Island, there were no signs at all of earthquake damage, and before long, I completely forgot about the possibility of more violent tectonic shifts.

Monad Shoal

At 6:00am, a dozen Filipino dive boats form a ragged line along the edge of the drop off. I sit quietly in the dawn glow, waiting for the sun to rise high enough to begin the first dive of the day.

The key to close encounters at Monad



Tigertail seahorse



Shoal is to dive (and shoot) without artificial lights or camera strobes. Threshers have extremely sensitive eyes that are designed for hunting prey in the half-light. Understandably, they do not respond well to flash photography and will bolt at the first sign of a bright light.

Around 6:30am, I join the ranks of bleary-eyed divers slipping below the waves, and descend through clear water to a steep sandy slope at 80ft/24m. When my eyes finally adjust, I see that the lower edge of the slope takes a sharp downturn and plummets past a series of deeper ledges into liquid night. To my right, a coral spur (covered in cleaner fish) juts out from the slope but it is devoid of sharks so we swim on.

As we approach the next cleaning station, Tata—my eagle-eyed divemaster from Thresher Shark Divers (TSD)—gives me a 'halt' signal the points insistently along the slope. Straining my eyes in that direction, I drop to the sand and try to look small and nonthreatening.

When the first thresher materializes, there is nothing obviously predatory about its demeanor. As it snakes past me, the 3m long animal seems confident and nervous in equal measures; an accomplished deepwater hunter forced out of its comfort zone by the need to rid itself of parasites.

Thresher sharks spend much of their lives in the open ocean hunting schooling fish. Over time, they accumulate copepods, sea leaches and various other parasitic organisms that irritate their skin, especially around their vulnerable gill openings and on the trailing edges of their fins. Cleaning stations like the ones at Monad Shoal are a critical part of their



THIS PAGE: Thresher sharks at Monad Shoal

Thresher Shark Divers' banka—a thin, wooden-hulled boat with bamboo outriggers



Gato Island gate house and protective cliffs (left); Brooks urchin shrimp (above)



Thresher shark at Monad Shoal

daily hygiene regimen.

I continue to hunker down as the thresher approaches the cleaner fish. On its third pass, the shark stalls a few meters in front of me and drops its tail. It's a clear signal to the cleaners to begin work. Right on cue, a variety of bannerfish, angels and various other parasite eating teliosts swim towards the shark and get busy. The thresher remains motionless for half a minute and then sinks out of view.

Back on board TSD's roomy banka (a thin, wooden-hulled boat with bamboo outriggers), I relive the encounter and wish that I could slip back in for a second dive. But by 8am, the tropical sun burns down through the water column, and the threshers retreat to the safety of the deep.

Gato Island

In the afternoon, manta rays visit the cleaning stations at Monad Shoal, but I will have to skip that encounter this time around because our banka is headed to Gato Island. The locals say that divers

come to Malapascua to see thresher sharks but they leave remembering Gato.

Gato Island is so small that you could easily swim around it on a single dive but no one does because there is simply too much to take in. The island is shaped vaguely like a pyramid and undercut from erosion along the waterline. A small guard's shack clings to its coral foundations but there is no guard in residence.

Tata explains that ownership of the island is being disputed by two different provinces. With little government funding available, the dive shops on Malapascua pay the guard's salaries but they can't police Gato until the dispute is over. In the mean time, the island is under constant siege by illegal dynamite fishermen.

A large cavern runs completely through the island forming a colourful swim-through and a quiet resting place for whitetip reef sharks and whitepotted bamboo sharks. Shimmering bullseyes and silversides swim in dizzying circles in

Malapascua



Coral garden at Gato Island



Malapascua

LEFT TO RIGHT: Hermit crab with adornments; Coleman shrimp; Porcelain crab

gloomy recesses in the rock and large anemone-toting hermit crabs drag their elaborately adorned shells across the cave floor like society women showing off their outrageous hats.

The shark cave is clearly the headline act at Gato Island but the macro life on the surrounding reef slopes will keep you busy for days. Tata swims along the sand flipping over one heart urchin after another. Each holds a different surprise. On one, a pair of brooks urchin shrimps wave me in for a potential manicure. On another, two coleman shrimps do their best to blend with a purple fire urchin's spines and on a third, a bold little zebra crab tiptoes over its prickly host in search of scraps. After a second great dive through the cavern I am completely sold on Gato Island and make a mental

note to come back here before I leave.

Bad Easter

An hour later, I am back on Malapascua enjoying the sunset from the comfort of the beach bar at Tepanee Beach Resort. The staff—like everyone I meet on the island—are charming and polite but refreshingly relaxed and quick to giggle amongst themselves at the slightest provocation. I could get very comfortable on this slip of land but the first Europeans here felt rather differently.

The name Malapascua was coined by Spanish sailors that spent a long and lonely Christmas holed up on the island. Desperately homesick, the seamen called the Island "Mala Pascua" which literally means "Bad Easter". Had the aqualung



Whitespotted bamboo shark at Gato Island



Location of Malapascua Island on map of the Philippines (right); Location of the Philippines on regional map of Asia (above)



Diver at *Dona Marilyn* wreckDiver with broadclub cuttlefish (above) and giant frogfish (top right) at *Dona Marilyn* wreck

Malapascua

been invented back then, the island might have been named Bella Pascua!

The next morning I join the other shark divers on a deep ledge to watch the threshers slip in and out of visibility. TSD runs a dawn trip to Monad Shoal virtually every day of the year (barring earthquakes and super-typhoons). Sightings hover around 98 percent—an incredible success rate when you consider that there is virtually nowhere else in the world that threshers can be reliably encountered.

Now and then, they even see a few bigeye threshers—a species with extremely large eyes that is usually found in much deeper water.

***Dona Marilyn* Wreck**

Another deep site not far from Malapascua is the wreck of the *Dona Marilyn*—an inter-island ferry that fell victim to Typhoon Unsang in 1988.

After 25 years underwater, not a lot of the wreck is visible under the sheer weight of coral festooning its decks and superstructure. Giant frogfish and broadclub cuttlefish are some of the easily recognizable residents but keen-eyed divers may also stumble upon a variety of nudibranchs, ornate ghost pipefish and the universally popular pygmy seahorses.

Chocolate Island

Later in the week—after our daily dawn thresher encounter—we head to Chocolate Island. I ask three separate divemasters how the island got its name and get three humorous and utterly implausible responses. When we finally submerge, all becomes clear.

The algae and corals that grow in the shallows around Chocolate Island range from dark brown to olive drab. Although healthy, it is not the most



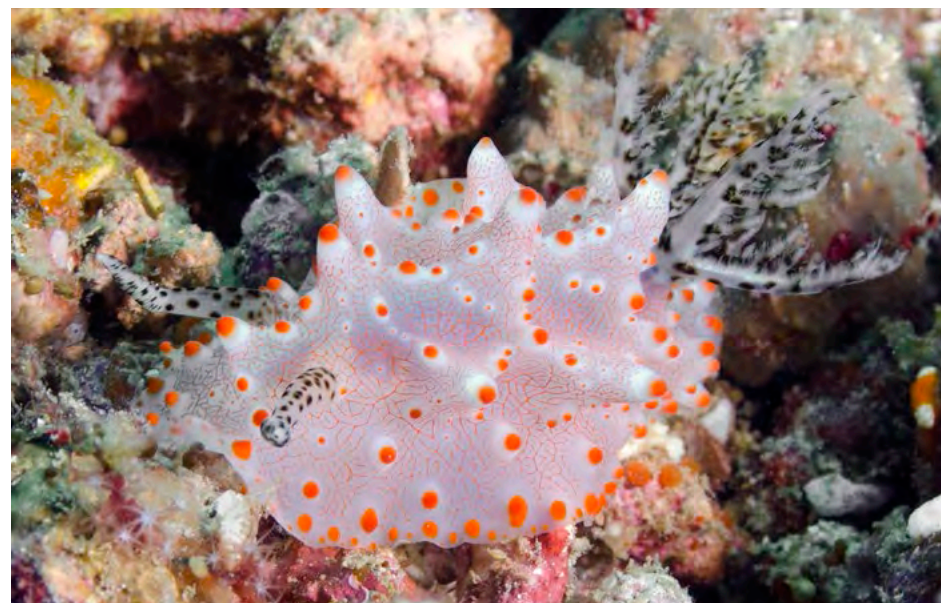
Denise's pygmy seahorse



Malapascua



TOP LEFT TO RIGHT: Ornate ghost pipefish at *Dona Marilyn* wreck; Blue-ringed octopus and mating mandarinfish at night at Lighthouse Reef



visually appealing site, but Tata assures me that it's a macro wonderland, and after one dive, I couldn't agree more.

Within a few minutes, I manage to spot dozens of different nudibranchs grazing on the algae and more cleaner shrimp varieties than I have ever seen before.

Macho mandarinfish

With my brain firmly set on macro-mode, I decide to sign up for a night dive to Lighthouse Reef. The seabed here is completely covered by a meter-thick blanket of acropora coral—an excellent habitat for mandarinfish.

Not just beautiful, mandarinfish also make great study subjects for anyone interested in fish behavior. All year long, mandarins indulge in elaborate mating rituals, ballet-like courting displays and dramatic climaxes in which the male and much smaller female throw caution to the wind and swim far above the reef. Then, quivering in what looks like ecstasy, they release a tiny cloud of sperm

and eggs into the night. As if coming to their senses, the happy couple then dart back into the safety of the acropora.

Tata swims directly to a nondescript patch of coral where half a dozen mandarinfish are going about the serious business of courting, fighting and mating.

As we look on, two rival males size each other up and then crash head long into each other and bite down on one another's gill regions. Locked together in this way, the macho mandarins spin in circles until one gains supremacy over the other and chases the inferior suitor away. The winner then struts towards a patiently waiting female like a barroom brawler that has just 'taken out the trash'. Apparently impressed by the show of bravado, the tiny female stays put while her alpha male swims erratically around her.

I am utterly entranced by the mandarins, but Tata drags me off to shoot a colony of tigertail seahorses a few short kicks away. Although

THIS PAGE: Assorted nudibranchs at Chocolate Island



Malapascua



TOP LEFT TO RIGHT: Spotfin lionfish, tigertail seahorses and big-fin reef squid at Lighthouse Reef; Banded pipefish (left)



barely 10cm tall, they look enormous compared to the 6mm Denise's pygmy seahorses that I photographed earlier in the week.

Nearby, a sinister looking spiny devilfish, claws its way across

a sand patch to a coral head inhabited by three different species of lionfish and two blue-ringed octopuses. Above the reef a male bigfin reef squid flashes orange then blue and purple.

There is clearly too much going on here for me to absorb in just one dive so I add Lighthouse Reef to the rapidly expanding list of sites that I need to revisit.

Super-typhoon Haiyan

By the end of the week my must-dive-again list includes virtually every site that we've been to. I clearly have to come back, but shortly after I get home, the headlines are filled with stories about super-typhoon Haiyan.

From the aerial images, it looks as though Cebu Island has been flattened by a giant steamroller. The death toll is almost incomprehensible. For the next few days, I wait patiently for news from Malapascua. The island was directly in the path of the storm and I wonder if it has been wiped off the map forever.

Then the first reports finally

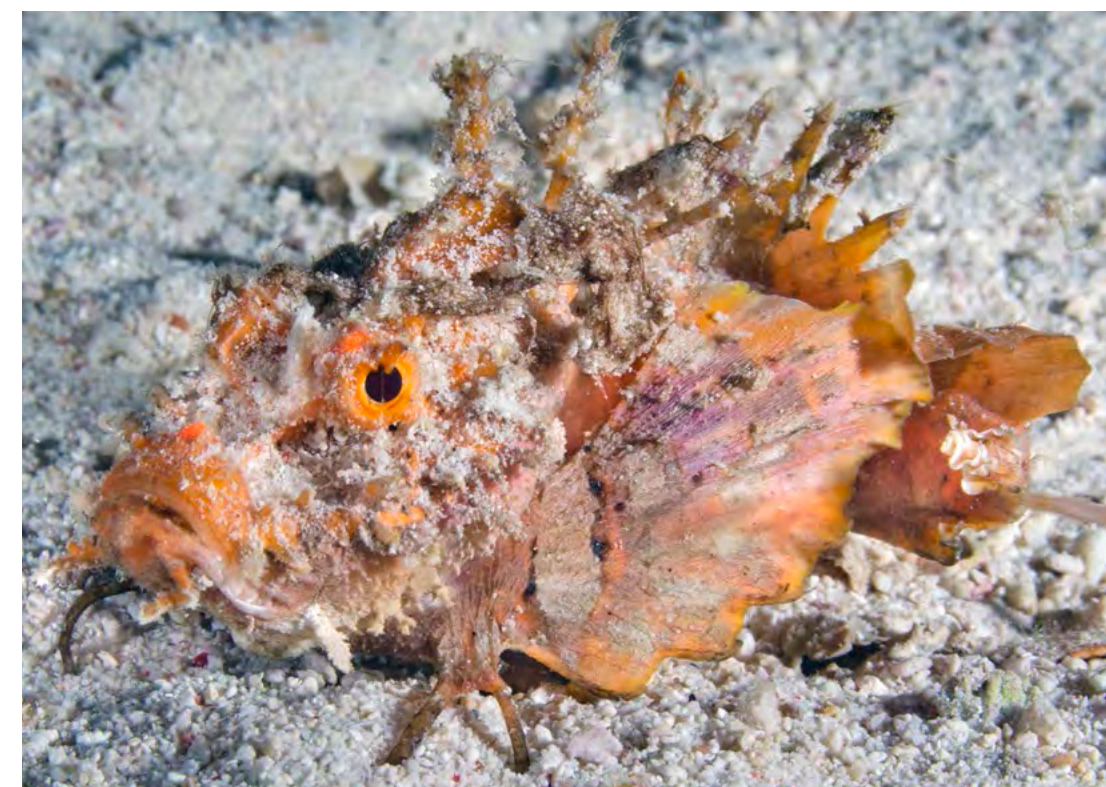
come in: most of the locals are safe and the resilient Malapascuans have begun to rebuild their homes. Amazingly, Tata and the other dive masters from TSD are already back in the water analyzing the effects of the enormous waves that accompanied the storm. Like many buildings on the island, their shop sustained some serious damage but not enough to keep them closed for very long.

Reports from underwater are just as promising. As sometimes happens after a big storm, a few things have been moved around, but right now the marine life close to shore is actually better than it was before Haiyan, and because of its depth, the thresher shark dive at Monad Shoal

was completely unaffected. So by the time I get back to Malapascua next year, it looks like I will be able to tick off all those must-

dive-again sites from my list and then hopefully add a few more. □

*Andy Murch is a photojournalist and outspoken conservationist specializing in images of sharks and rays. **Bigfishexpeditions.com***



Spiny devilfish (above) and mandarinfish courting (left) at Lighthouse Reef



Risk Management for

Solo Divers

*Some people dive
solo and actually
have no idea they
are doing so.*

Text by Steve Lewis

Diving is risky business. Just how risky depends on a whole shopping list of factors and influences, but let's agree that there are more risks involved with diving than, say, sitting in your basement watching Olympic curling on TV.

Now if we were to apply similar logic and argument, we could go further and make the point that solo diving carries an additional level of risk over and above the "run of the mill" stuff associated with regular diving. There are a few subtle points that need to be clarified if we are to fully understand that last statement, but we'll get to it in a few paragraphs. Let's simply agree that solo diving carries a few risks that are unique to... well... diving solo.

Yet, it is done every day. Indeed, some people dive solo and actually have no idea they are doing so... but more about that later.

Notwithstanding that at least two scuba training agencies teach courses intended to train independent or solos divers, you can find a whole bunch of people within the diving community who do not believe the additional risks associated with solo diving can be managed at all. These folks will

give anyone admitting that they dive alone or who are even thinking about diving alone, the sage advice that they are crazy. "You are risking certain death, because solo diving is nuts," is the usual line.

These folks mean well. The circumstances that inform their opinion usually centers around being told—perhaps in an open-water training session—that diving alone is dangerous and not recom-

mended. And bless 'em, they cannot see further than that.

Shake up

In 1999 (or thereabouts), what was then a brand-new training agency—called Scuba Diving International (SDI)—took the old-school recreational diving market by the scruff of its neck and gave it a good shake. They did it by launching a unique specialty course called Solo Diver—a program that taught recreational

sport divers what tools and techniques would help them stay safe when diving on their own. And this was something no other agency had dared do before.

The logic behind the launch was that as risky as solo diving might be, divers were doing it anyway—many unaware they were effectively diving alone. The thinking behind the launch was that at least with a structured and sanctioned training program in place,



people could at least approach solo diving with the right mindset and correct equipment to do it with the proper controls in place.

When the folks at a training agency come up with a brand new idea like, "Hey, let's teach people to dive solo," taking that concept from a doodle on the back of a paper napkin to a full-blown program with instructor guides, student materials, and standards underwritten by a reputable insurance company, involves a



Doing "their own things," is a diplomatic way to describe the buddy skills of most underwater photographers!

great number of steps that follow a pretty well-defined pathway. Anyone who's been involved in the task will tell you it's not an easy process.

Solo diving was defined as self-sufficient diving

The first step is to define what it is you intend to teach and to whom. Solo diving was defined as self-sufficient diving. To define the program's target market, was not as straightforward. The circumstances where someone might find themselves diving solo had to be a little broader than simply diving without a buddy and being in the water with nobody else around.

Definitions

For instance, solo could also be defined as someone diving with a buddy who is way less experienced and upon whom they would rather not rely in the case

ing solo. By the same token, solo diving might also be someone who dives with other folks in the water, but who is doing "their own things," which is a diplomatic way to describe the buddy skills of most underwater photographers!

Insta-buddy experience

It may also describe a traveling diver who finds themselves on a dive boat coupled with an "insta-buddy" whose experience, abilities and dive habits are a total mystery. And solo diver fully describes every instructor who takes students into the water in a class setting. In an emergency, that instructor MUST be capable of "self-rescue," because it would be unfair and perhaps unrealistic to rely on a student to help.

Having defined what solo diving is, the next steps are to understand and define just how risky each of those situations is, and if those risks are manageable. In reviewing its solo diver program, SDI's training advisory panel looking really closely at the previously common blanket statement, "You are risking certain death, because solo diving is nuts," to see if it is indeed true or simply blinkered thinking.

In the world of diving, risk management always begins with a risk identification stage: what risks does the activity—in this case solo diving—carry with it and what is its potential outcome? The next stage is to assess each of the identified risks on a scale that stretches from Very Likely to Extremely Unlikely. And the third stage is to come up with a tactical plan that avoids or mitigates ALL the very likely and likely risks, as well as dealing comfortably with the risks that have only a small chance of happening.

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Solo could also be defined as someone diving with a buddy who is way less experienced and upon whom they would rather not rely in the case of an emergency.

Solo Diving

The circumstances where someone might find themselves diving solo had to be a little broader than simply diving without a buddy and being in the water with nobody else around.



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Perhaps the most commonly cited “additional” risk associated with solo diving is running out of something to breathe. To the classically trained old-school open-water dive instructor—and graduates from his courses—flipping your buddy the OOA sign and breathing from one of his regulators is the tried and true solution in this scenario. In reality this option is not always available.

Where’s your buddy?

For example, what if your buddy isn’t around? What if her gas supply is also down to seeds and stems? What if you really should do a safety stop and your buddy isn’t in the mood to hang around at six metres for a few minutes before surfacing? Obviously, if you are diving without a buddy, there is nobody with whom to share gas, and all this becomes academic. Clearly, these situations present a challenge.

... flipping your buddy the OOA sign and breathing from one of his regulators is the tried and true solution in this scenario.

In reality this option is not always available

To someone with a background in technical diving, the concept of running out of gas and relying on a buddy to get you back to the surface, is a bit of an anathema. Most technical divers regard running out of gas careless at best. Technical divers spend a lot of time and effort, and money, planning things so they do not run low on gas.

A far most constructive and robust solution is to NOT run out of air, and this can easily be accomplished by using a real gas management plan.

A properly trained solo diver knows their personal gas consumption rate. They know how many litres of cubic feet of gas they have at the start of their dive and they budget their time and depth, not just on the time that their PDC (personal dive computer)

will allow them before decompression, but more importantly the time and depth that their STARTING GAS VOLUME will allow them while keeping a sensible amount back for contingencies. There is nothing difficult or revolutionary about teaching proper gas management to sport divers; however, it is often neglected. For a solo diver it is a required and an important skill to master if one wishes to dive with any margin of safety.

Equipment failure

There is of course, another side to the running out of gas scenario: equipment failure. While the practice is common among sport divers, diving with a single regulator first stage and no redundant gas supply is extremely risky... buddy or no buddy. With only one “life-support system,” a diver—any diver—is totally done for if in the case of total equipment failure or even a minor

A far most constructive and robust solution is to NOT run out of air, and this can easily be accomplished by using a real gas management plan.

inconvenience such as a missing mouthpiece.

Once again the “normal” solution is to rely on your buddy to help. For someone committed to self-sufficiency and diving alone, the better solution is to carry a back-up. A properly equipped solo diver carries a small volume cylinder of gas fitted with a regulator and SPG. In the parlance of technical diving, this extra cylinder is often called a stage bottle, but in the language of solo divers, it becomes a buddy bottle. Effectively, it supplies enough gas to get the diver from their maximum depth back to the surface at the prescribed ascent rate including a safety stop, with a margin of contingency gas... just in case.

Another risk that is presented who pooh-pooh the idea of diving

without a buddy is getting lost or entangled. The thinking is that with a buddy in tow, they will offer assistance. They will help if you are confused about the location of the exit, lose your mask, or are attacked by a strand of kelp or discarded fishing line. Once again, this shifts an awful lot of responsibility for one’s own well-being off your own shoulders and onto someone else’s. There is another way.

Surface marker bouys

Solo divers are taught to carry and use a delayed surface marker buoy and a spool or reel so that it can be deployed from depth. This effectively becomes the diver’s personal ascent line and alleviates one issue. Carrying and being able to deploy a back-up mask deals with another. Entanglement is a more sticky issue. Solo divers are taught to avoid areas where entanglement is a real threat, but just in case carry more than one cutting device (and train how to extricate themselves from an entanglement using one of those tools

and or common sense).

Avoid panic

In all three of these issues, one of the key guidelines is to avoid panic. “Stop, breathe, think, act” are the watchwords and as such perhaps more valid for a solo diver than for any other.

The ability to control panic when things go pear-shaped at depth is a function in part of experience. For example, the prerequisites for SDI’s Solo Diver are for the diver to have logged at least 100 dives. I guess the agency believes that although logging that many dives offers no guarantees, it’s a workable benchmark.

There is one other risk that’s quoted as unique for those without a buddy to keep them in check. When diving alone, it is possible to drift beyond one’s comfort zone and into the land of panic. A buddy, in the best-case scenario, provides a sober second opinion and will help prevent you from pushing beyond the limits of your training and experience.

Solo divers are also encouraged to share and discuss their dive plans with a friend or family member BEFORE putting the plan into action and going for a dive.



Solo divers are taught to carry and use a delayed surface marker buoy and a spool or reel so that it can be deployed from depth. This effectively becomes the diver's personal ascent line and alleviates one issue

growing number of instructors and divers believe that self-sufficiency begins with good training and part of that training is realistic and detailed risk analysis, self-assessment, and equipment choices.

Accepting risk

Finally, there are some risks that simply have to be accepted. For example, having a medical emergency underwater while diving alone has a very small chance of happening, but the magnitude of the potential outcome is the most serious possible. A good risk management plan may have suggestions to mitigate the health—maintain a healthy lifestyle and work to stay fit for example—but that can never be totally avoided. If your personal state of health is at question, never dive alone.

When solo diving was brought to center stage and had the spotlight shone on it, many old-school instructors and divers were upset. They argued that solo diving is wrong and nothing would change their minds. However, I believe a

Fact is that I believe in SDI's solo diver program, and those from other agencies teaching the same skills, have helped to produce a cadre of better divers, and ironically, a lot of really good potential dive buddies! □

Steve Lewis is a diver, instructor, dive industry consultant and author. He teaches and lectures at home and abroad. His main focus is to dive safety and to make each of us aware of the things that will make us better divers than we are now. His latest book, Staying Alive: Risk Management Techniques for Advanced Scuba Diving, is available through Amazon. For more information, visit www.techdivertraining.org or www.cccave.training. Steve will be one of more than 30 speakers at EuroTek 2014 being held in Birmingham, United Kingdom, September 20-21.



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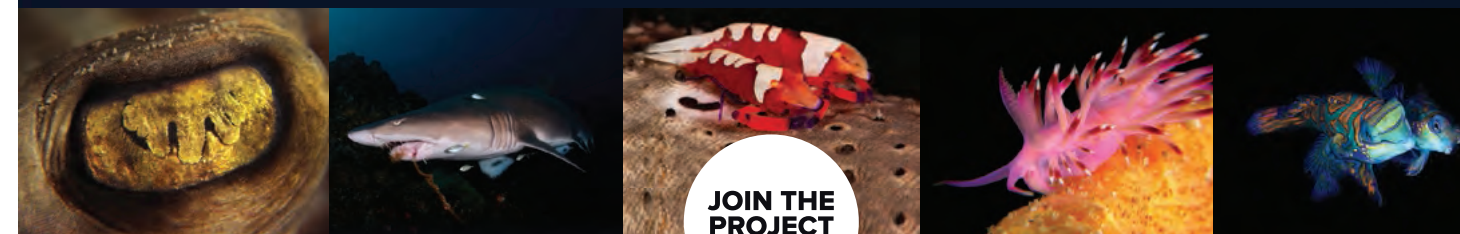
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photo & video

Author and
photographer
Kurt Amsler
freediving
with underwa-
ter camera

Text and photos by Kurt Amsler
Translation by Peter Symes

Taking pictures while freediving can be a real physical challenge, but in some cases, it may be the only option to get the subject in front of your lens.

Freediving in order to take underwater photographs is not the norm, but there are many freedivers who do just that—for example, the freediving icon Fred Buyle. It is also a good technique to use for practical reasons; Without noisy bubbles, it becomes possible to get closer to shy creatures. But the main advantage is that it's easier to keep up with fast moving animals, such as marine mammals and sharks, when you do not have to propel bulky scuba apparatus through the water, too.

The kit

Compared to the scuba laden shooter, the freediving photographer tends to swim further and faster, so camera rig and equipment need to be optimised for these circumstances. The choice of diving equipment is also important, which will be discussed in further detail below.

The goal is to keep the camera as hy-

drodynamic and compact as possible. While artificial light is needed, only one flash unit should be mounted. A double-flash configuration would produce substantial drag and appear too large to

an animal, scaring it off. In general, the classic apnea subjects—such as whales, dolphins, sharks, manta rays and other pelagic marine animals—live in the surface layers of the sea where ambient

light is sufficient.

But even without a flash, the housing should have as little resistance as possible. Big dome ports, from 18cm of diameter and up, produce significant drag, so

if you plan to pursue freediving photography more actively, you should consider getting a smaller dome. However, there are a few points to be observed.

The smaller the diameter of the dome



Apnea Pix

Freediving for underwater photographers

ANDRAS GRUBER





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Freediving icon Fred Buyle



Freediving

Freediver Recovery Vest (FRV) electronics and two 38-gram CO₂ cartridges, which provide sufficient lift from depths of up to 45 meters

port, the less depth of field we get for a given aperture. This is related to the imaginary image the dome as a spherical lens projects in front of it. Using a 22cm dome, you may still achieve a full depth of field with an aperture of f:2.8, whereas with a 18cm, you will lose about a third of that. To compensate, the aperture needs to be stepped down to 5.8 or 8 in order to achieve a complete depth of field. For even smaller ports, the effect is even greater.

Back in the film (or analog) era, using ASA/ISO 100 using apertures from 2.8 to 4.5 were the order of the day, which is why the super dome ports were required to achieve full depth of field. Today, with modern cameras, where 400 to 600 ASA / ISO can be used without loss of quality, such large apertures are no longer relevant. Even under the most difficult lighting situations, it is rarely necessary to open up the aperture further than 5.6.

Exposure

When working with flash, everything is the same as before, and classic flash techniques come into

play, depending on whether wide-angle, standard focal length or a macro lens is used. The flash takes priority and is controlled by the aperture after which the capture of ambient light from the background is dictated by the shutter speed.

When working only with natural light, these rules no longer apply. Where a flash is not used to freeze the motion of fast moving animals, one depends



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order to save time. Once again it should be emphasized that shutter speed takes priority, and aperture and exposure is less important.

Should the aperture, in the case of too little ambient light, start to go below a value of 8 or 5.6, increase the ISO value rather than reducing the shutter speed!

Getting the shot

The difference between shooting while freediving and shooting while scuba diving is that the photographer usually has virtually no time to get the subject in front of the lens, let alone to mess about with camera settings. In other words, all important settings must be made prior to the dive. Already at the surface, the photographer can see the subject, assess the situation and decide from which side it is best approached, and then adjust the



on shutter speed. This must always be set faster than the relative movement between the subject and photographer, which of course depends on the situation. For example, when you approach a floating sperm whale, the shutter speed must be at least 1/350 seconds to ensure no motion blur occurs.

Ensuring correct exposure is then controlled via the aperture setting. In daylight photography, the camera can be used in automatic mode. With the camera set on "Shutter Priority", we do not have to care about anything, even if the lighting conditions vary. Only in situations where there is strong sunlight coming in from

the side, or in front of the camera, which should be avoided anyway, the +/- exposure correction can be set at approximately 2/3 stop of overexposure. It is, of course, also possible to use the camera in "manual" mode and use the built in light meter as a guide, but I generally recommend using an automatic mode in

Freediver Fred Buyle in shark encounter



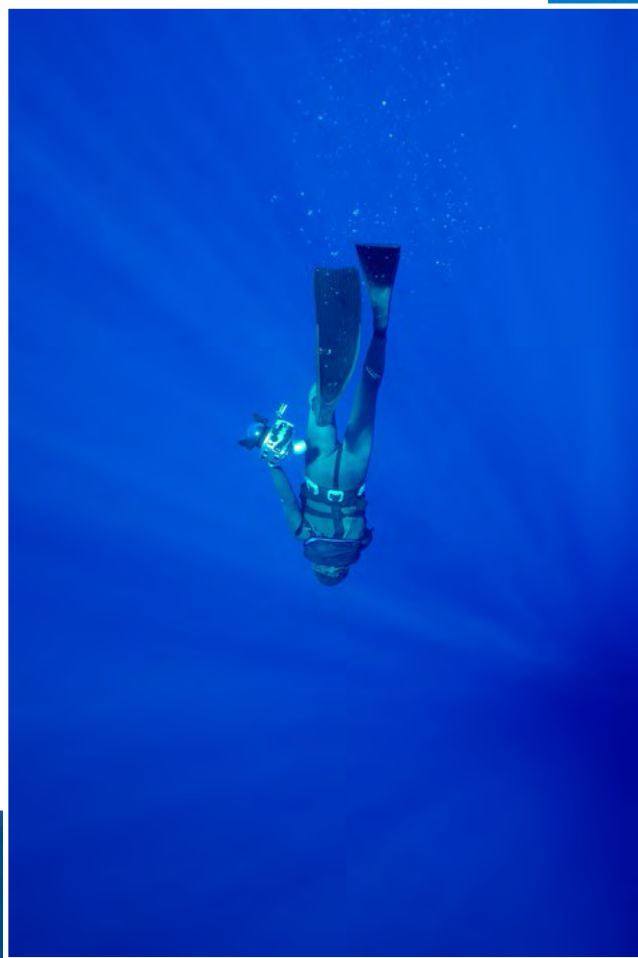


photo & video

Underwater photographers freediving with whale shark (right); The proper streamlined silhouette of a freediving photographer with streamlined camera gear (below)

camera settings accordingly.

A proven trick when capturing marine mammals, sharks and schools of fish is to preset the focus, so that the autofocus will not go hunting among several moving subjects. For example, while holding your legs out straight, focus your camera on the tip of your fins. Then flip the AF / M switch from Autofocus to Manual focus, which will then leave the focus setting where it is. Since we usually work with the aforementioned subjects



with super-wide angle or even fisheye lenses anyway, a f: 8 aperture will produce a depth of field from about 80cm to almost infinity. To benefit from this old trick, the underwater housing must, of course, have such an AF/M switch.

When working with natural light, the subject should appear fully lit, which means that you should approach the subject with the sun at your back. With the sun coming in from the side or even from the front, the subject tends to appear too dark

against the background and the water can appear cloudy and dull, too. Exceptions are, of course, deliberate creative choices or backlit scenes.

Diving technique

It is not just the camera gear that needs to be streamlined, so does the dive equipment. Consequently, freedivers equip themselves accordingly—with tightfitting, smooth suits, long fins, masks with small volumes and short simple snorkels.

Breathing technique, pressure equalization methods, etc, remain the same for the most part, but may be adjusted according to the shooting situation. It is, for example, impossible to calmly prepare for a dive while swimming alongside a whale shark.

It is important, whether diving with or without a camera, to get the weighting correct so positive buoyancy will be set in at around six meters of depth.

Equally important is to not exceed dive times beyond training levels and to

be mindful of safety. It is only too easy to become fascinated with a particular subject in the viewfinder and ignore or suppress the respiratory stimulus and hunger for air for too long, increasing the risk of hypoxia or shallow water blackout just below the surface.

To this effect, multiple U.S. champion, Terry Mass, developed the freediving lifejacket. The “FRV” (Freediver Recovery Vest) is equipped with a timer and depth gauge, which can be individually programmed to suit personal needs. The vest

Freediving



Freediver with inflated FRV, or Freediver Recovery Vest





photo & video

The Magic Filter restores many of the colors that are lost underwater due to absorption, from six to 15 meters approximately



is automatically activated depending on the programming, or by hand. The FRV consists of two bladders, which fit very snugly, and a small neck part, which houses the electronics. It does not prevent any freedom of movement and has little water resistance. The volume of the bladder is 16 liters and is equipped with two 38-gram CO₂ cartridges, which will provide sufficient lift from depths of up to 45 meters.

Color correction filter

I also recommend bringing the so-

called "Magic Filter", which, at depths from about six meters to about 15 meters, depending on water clarity and sunlight, will restore a large part of the colors that are otherwise lost by absorption.

The principle is based on the conversion of color temperature and color balance. This unique invention takes advantage of the technology that comes with modern digital cameras and is primarily designed for wide angle and fisheye lenses. For shooting against the surface and at depths less

than six meters, it is not well suited as the ambient light will appear lacking magenta.

Using Magic Filters where no artificial light may be used is a no-brainer, but for greater depths and sunless days, it is best to do without it. The filter only works optimally in bright sunlight and clear water. And the colors are the most beautiful when the subject is fully illuminated.

There are Magic Filters for the most popular and super-wide fisheye lenses. Recently, they have also been produced for compact cameras. For more information about sizes and compatibility, please visit www.magic-filters.com.

For more information about Kurt Amsler and his underwater photography courses, please visit his website at: Photosub.com



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Gates Arri Alexa Housing

Gates Underwater Products has announced it will be releasing two new housings for the Arri Alexa cinema cameras. One of the new housings will be for the Arri EV and XT camera models and the other will be for the Arri XT Plus. Both housings will feature Gates Precision Port and support over 70 PL mount lenses. Gates is advising that both housings will be available in the fourth quarter of this year and prices will be confirmed prior to release.



Sea&Sea RX100-III Housing

Sea&Sea has also announced the new housing for the Sony RX100-III compact camera. The MDX RX100-III housing is made from black galvanized, corrosion resistant, aluminum. Sea&Sea states that the design allows the camera's internal flash to be activated and used to trigger external strobes via fiber optic connections. The housing's design also allows the camera's LCD to be set at a ten degree angle, making it easier to use when composing images underwater. Access to the RX100's front and rear control dials, which are critical for using the camera in manual mode for underwater photography, are built in to the new housing. The MDX RX100-III will be available in early September at a U.S. retail price of \$996.



Subal ND4S Angler Housing

Respected Austrian housing manufacturer Subal has announced its new housing for the Nikon D4s SLR camera. Subal is calling the new ND4S housing the "Angler" and states it is the first of a new series of next generation housings the company will be releasing. The housing provides access to all the important camera controls on the D4s and is compatible with the preceding Nikon D4 camera. The ND4S Angler is available now at a U.S. retail price of \$6,500.



Recsea RX100 III Housing

The Japanese housing manufacturer Recsea has announced its new housing for the Sony RX100 III compact camera. The WHS-RX100 III housing is CNC machined from anodized aluminum and provides access to the front and rear command dials on the camera, both of which are critical for using the camera in manual mode for underwater photography. The rear command dial also has a push button function for accessing the center button.



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Sony PXW-X70 Camcorder

Sony has announced the upcoming release of a pro XDCAM camcorder which will be upgradeable to 4K before the end of 2014. The PXW-X70 camcorder features a 1-inch type Exmor® R CMOS sensor together with a Zeiss Varion Sonnar T lens and Wi-Fi control. The camera will be available in fall 2014.



Ikelite RX100 III Housing

Ikelite has also released its housing for the new Sony RX100-III. Importantly, the housing provides access to the RX100's front and rear control dials, with a rotating gear wheel on the front of the housing to provide easy access for front control dial. Both these control rings are critical for using the camera in manual mode for underwater photography. The housing also features dual fiber optic ports for strobe triggering.



Nauticam GH4 Housing

Nauticam has announced their NA-GH4 housing for the very highly regarded Panasonic Lumix DMC-GH4 camera. The NA-GH4 is configured to maximize the excellent video potential of the Panasonic GH4 camera and features a thumb operated button for ISO adjustment, a lever for white balance and access to both control dials. Nauticam also announced the availability of an inexpensive upgrade kit for owners of the earlier NA-GH3 housing who wish to use it with the GH4. The NA-GH4 is available at U.S. retail price of \$2,250.



Jason deCaires Taylor



P O R T F O L I O





Detail of *The Silent Evolution* (2012), depth 8m, MUSA Collection, Cancun/Isla Mujeres, Mexico



Taylor

Inertia (2011) above and a detail of *The Bankers* (2012) on the previous page at 5-6m depth, MUSA Collection, Cancun/Isla Mujeres, Mexico

British artist Jason deCaires Taylor has created unique underwater sculptures and installations in locations all over the world. We first interviewed him in 2007 when he finished a photo-documentary of one of his earliest works in Grenada. Now a well-known artist and celebrity with international media coverage, Taylor is much sought after by many centers of tourism wishing to draw divers to their waters or rejuvenate sandy sea areas with renewed reef and marine life that thrive on his creations.

Text edited by Gunild Symes
Photos and all sculptures
by Jason deCaires Taylor

X-RAY MAG: How has your purpose or approach to underwater sculpture evolved and developed since the first sculptures you created in Grenada?

JDT: I am always interested in trying out new ideas, experimenting with different concepts and advancing techniques to create the pieces but I am now more focused on trying to highlight the grave threats to our marine ecosystems and the controversial subjects surrounding oceans and climate change.

Now that I am better known, I have more free rein on the design front and able to explore more divisive subjects.

One of the sculptures in Mexico, for example, is of a politician with his head buried in the sand. It was not the first thing the tourist board or local government wanted to highlight. Likewise, the sculpture of the guy on the sofa called "Inertia," it's about our relationship with the natural world and tourism... how people just see these locations as sunny places to go and consume when in fact their interactions directly affect the environments they are going to.

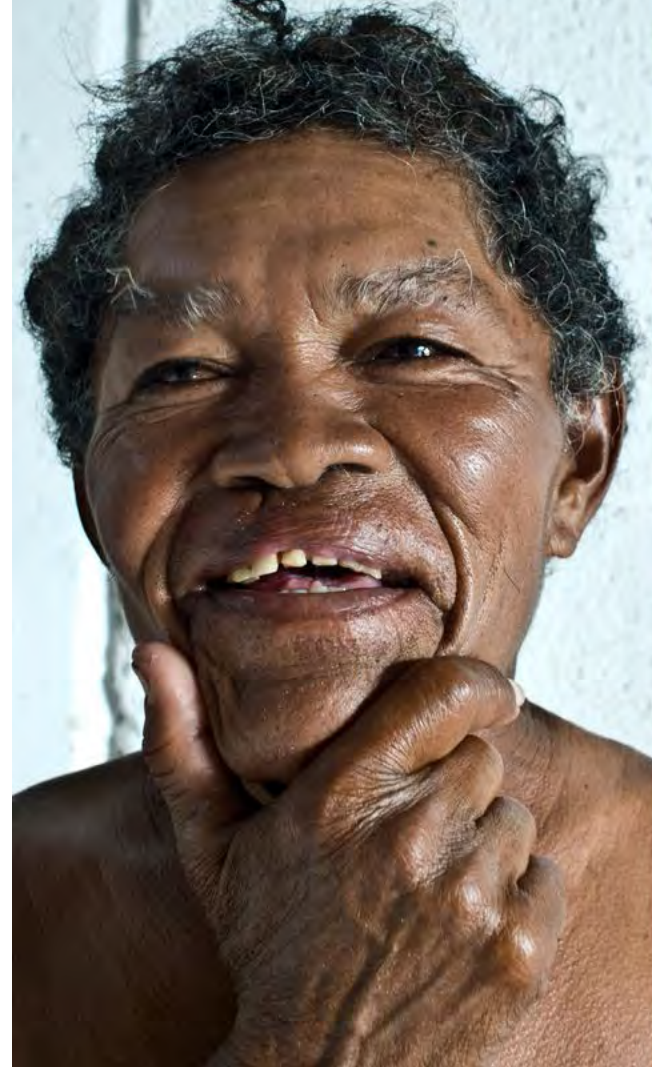
X-RAY MAG: Are you trying to raise awareness in divers about these conservation issues?

JDT: It's not so much to influence the diving community, but more the general public. Most divers are fairly aware,



—maybe not in Cancun, where there are still a lot of novices or first time divers with poor buoyancy skills and are still touching

the corals. I still see snorkeler's standing on reefs in some places. However, in most areas, divers are fairly respectful. It's more about



Stages in the creative process from local participant to life cast sculpture in reef-friendly cement to coral colonization, *The Silent Evolution*, Mexico; Algae, sponges and hydrozoans on *Viccisitudes Girl*, Grenada, West Indies (left)

trying to connect to a wider audience and bring a piece of our magnificent oceans into their living rooms.

X-RAY MAG: How have people responded to your message over the years?

JDT: It is difficult to gauge the response, but I must say, overall, in direct feedback and on social media, it has been very positive. I invest a lot of time and energy into good documentation of my pieces and the growth on them in order to help people experience the works. I have been told by many people it reminds them of a line from *The Tempest* [by Shakespeare]:

"Full fathom five thy father lies;

Of his bones are coral made;
Those are pearls that were his eyes;
Nothing of him that doth fade,
But doth suffer a sea-change
Into something rich and strange."

X-RAY MAG: What about your artistic methods, has this changed over time?

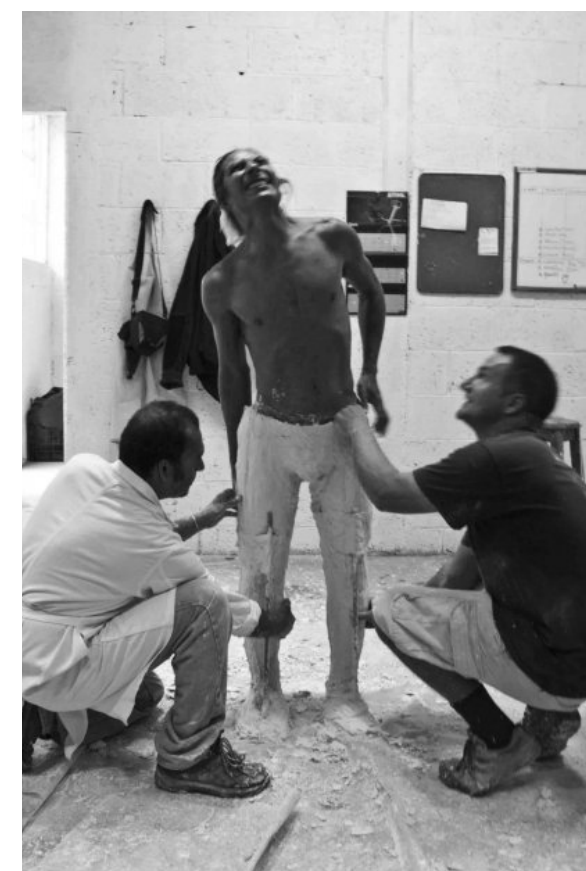
JDT: I am always working harder to improve ways in which the sculptures become habitats. I have used a lot of traditional sculpting methods in the past, but at the moment, I am designing a project for the Bahamas using 3D digital technology and CNC cutting machinery. It is going to be 100 tons in weight and six metres high. The piece will assemble in sections underwater like a layered jigsaw.

X-RAY MAG: Who helps you? How do you coordinate your team of helpers, assisting divers, in the production of your works?

JDT: Various people at different points. The techniques I use require many work hours—i.e. life casting, mould making—so I have a lot of help in the studio, then a different team who work with the installation: marine engineers and dive technicians.

X-RAY MAG: Are they all volunteers or are they paid?

JDT: It depends on the project budget. I certainly prefer experienced staff. Sometimes it's difficult to find sculpting skills in remote places but I always, if possible, hire from the local commu-



Traditional life casting process, with artist Jason deCaires Taylor on the right



Anthropocene (2011), depth 8m, MUSA Collection, Cancun/Isla Mujeres, Mexico; Illustration (right inset) shows access holes and retreats for lobsters inside sculpture; Since the sculpture weighed more than a crane could handle, floats were used to lower it (far right)

nity. Divers can sometimes be hard to get hold of because I only need them for key events when I am installing the pieces. This usually coincides with peak season when the weather is calm and most dive professionals are busy.

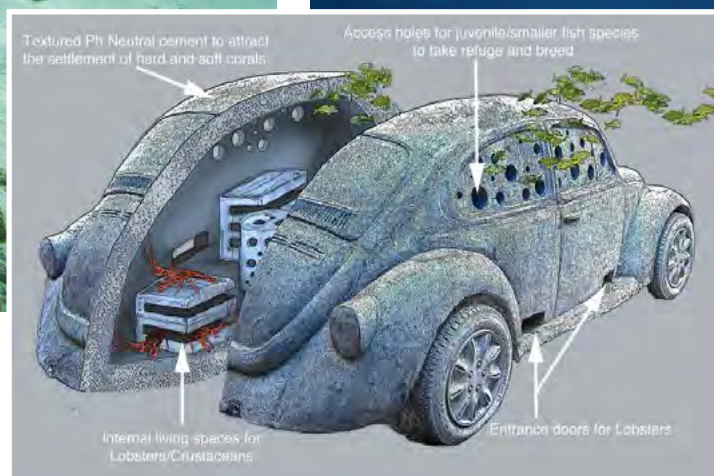
X-RAY MAG: Are they technical or commercial divers, advanced in training and skill?

JDT: Sometimes I use commercial divers, which is great because it's quite hazardous work and requires good experience. But often I use instructors or dive masters from local centres. Having a good boat crew is equally as important. As with most diving, the weather generally dictates how smoothly everything goes. Hopefully in the future, when I expand my operations, I will have a dedicated installation crew.

X-RAY MAG: Have you had to postpone the installation of a sculpture due to weather? What are the challenges?

JDT: Yes, there have been lots of delays due to weather. In Mexico it was quite open sea, so winds had a huge influence on activities. We've had our fair share of problems along the way—the 8-ton VW beetle, for example. It exceeded the weight capacity of the crane on the boat so we had to tow it over a 7km on floats. Due to the repeated wave action, it cut the ropes to the floats and it sank in the middle of the bay on a patch of sand. So we had to lift it again, which took so much time it began to get dark and we had to suspend all operations until the weather improved. Eventually, we managed to place it in the right spot.

X-RAY MAG: How has it been working

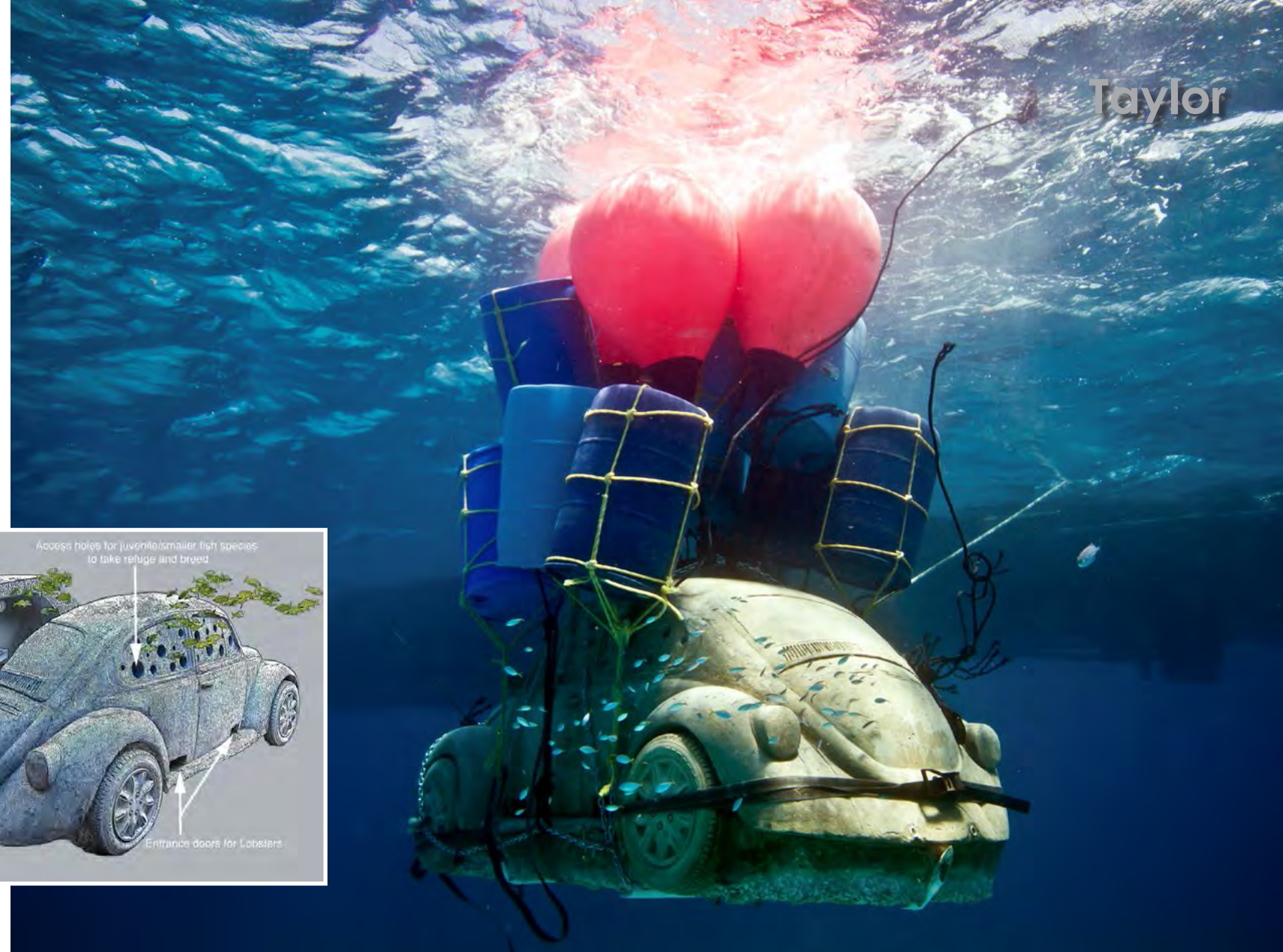


with governments and agencies involved with some of your projects? Any insights?

JDT: It's a constant challenge, applying for permits, fund raising, contracts, etc. Sometimes the overall objective gets lost. I always try to maintain work in the studio and share the visual documentation so everyone can see the reality of the project and what we are heading towards. Learning to adapt to the working practices of the region has been paramount and listening to local advice.

X-RAY MAG: Do you spend time visiting the location and meeting government agents before the project begins?

JDT: Yes, there's always a scouting trip—collecting field data, finding out



the objectives and the scope of the project, taking on board artistic considerations and getting a feel for the local environment.

X-RAY MAG: What has been your favourite part of the process or the production?

JDT: The photography is the part I really enjoy—I love watching how the sculptures visually change. The photography is sometimes so important it can, at times, actually dictate the making and deployment of the statue. I often make sure the best photographic angle is facing the sun or include intricate details, which I know will be lost in days but will make a great shot.



Diver at work installing sculpture

Taylor



X-RAY MAG: What camera and video equipment do you use to document your work?

JDT: I have a Canon SLR with Sigma lenses and video capability in a Sea&Sea housing. I used to have two cameras, but now they are combined into one. I also invested heavily in an underwater lighting system with underwater tripods and time-lapse equipment, placing small

CLOCKWISE FROM LEFT: Sea turtle swims over sculptures at night; Algae and coral growth on figures of *The Silent Evolution*; Gray angelfish over installation; and Southern stingray at *The Silent Evolution*, MUSA Collection, Cancun/Isla Mujeres, Mexico

cameras on the sculptures to record time lapses or deployments. I have a series of different lenses—but mainly macro and wide angle.

X-RAY MAG: How have you learned how to use this equipment? Did you take courses or learn on your own?

JDT: I am self-taught. Sigma sponsors my lenses and also provides technical support. Learning

how to use the equipment has mostly been through talking with colleagues and the camera crews who I have worked on projects with over the years.

But I am still not happy. I am a perfectionist. I want to get a new multi-panorama system, which is being developed in Spain and Germany. I am in talks with the developers, but the system costs around 40,000 Euros, so it needs carefully researching.



Taylor

There is also a permanent underwater time-lapse camera, which can be installed near the sculptures and also provides a live webcam feed. It cleans itself every minute to prevent algal deposits.

I recently collaborated with Google Maps. Their survey, the Catlin Seaview Survey, mapped the sculptures in Mexico, so now people can move in and through the sculptures virtually.

X-RAY MAG: How do you find out how divers, people, kids in the different parts of the world where your creations are displayed react to your art works?

JDT: Sometimes I go on tourist boats as a tourist diver to listen to what people say about the pieces and to see their reactions. What I find funny is how the dive guides invent their own stories behind the

meanings of the sculptures. You can see how so many myths come from the sea.

X-RAY MAG: What kind of fish and other marine life have interacted with your work?

JDT: Oh, it's another great pleasure to see what actually is colonizing the pieces—all sorts of bizarre things. In Mexico, there are very few gray angelfish. You'll see an odd pair here and there. But as soon as the sculptures were installed, very quickly a couple of gray angelfish came to swim on top of the sculptures. Then two months later—the viz was not so good—but I turned around and saw almost 100 huge gray angelfish, all full-sized adults. Other local divers said they never saw that many angelfish over the past 30 years.

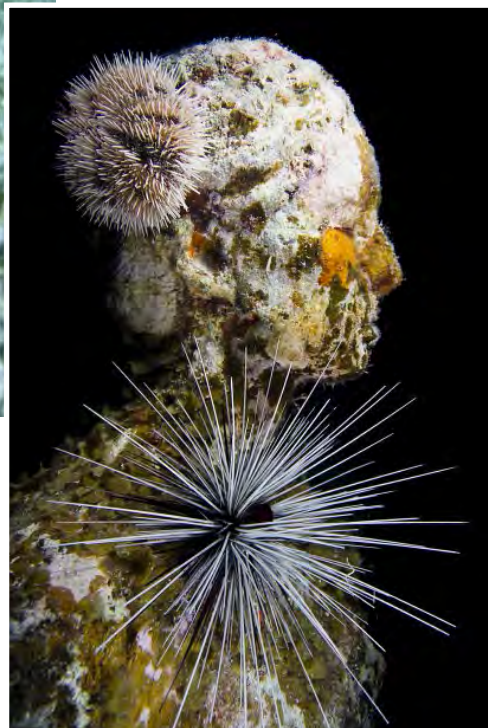




Then there are the crustaceans. We were really pleased that after a year there were 100 spiny lobsters on the "The Silent Evolution". It was great! But the next day, every single one was gone. A fisherman had been there and pulled all of them out. That's why we put the VW there with the habitat retreat for the lobsters. It's made with doors and curves that prevent the fisherman's barb from pulling them out. A year went by

and no spiny visitors. I thought it had failed, but then, just three months before I left, there were between 50 to 60 lobsters inside, and fishermen couldn't get them out.

I have seen some really beautiful sponges and tunicates, mainly on the high areas where there's current and the filter feeders can find nutrients. There are lots of polyps. It's great to see the growth from a tiny polyp to a full



size colony of corals.

X-RAY MAG: Your "Reclamation" sculpture, the angel with wings

made of sea fans... How did you devise that piece?

JDT: I wanted to create a kinetic element to the works as the gray cement finish can seem quite static. Sometimes after storms, sea fans are ripped off the reef and are either left on the sea bed or washed up on the beach. They eventually die. I developed a system whereby the fans could be rescued and clamped onto the body of the figure.

I have learned so much along the way. Algae for example—good algae and bad algae—it's really interesting. Divers always want to see the big pelagics, but all the hard work on the reef is done by herbivorous fish and urchins that keep check of the algal invasions.

My favourite time to dive is at night because then you can see

everything out working, in all its colour. You can really focus in on what is going on.

I found out that the sea urchins clean the sculptures every night, which is very convenient. So some of the newer designs include living spaces for urchins, which need protective spaces to retreat to during the day. The pieces that are cleaned by urchins have the best coral growth because the invasive algae is held back. Urchins do not walk on sand very well, so we also sculpted bridges to assist them.

Each sculpture dictates the



Reclamation (2012) and Resurrection (2013) of the MUSA Collection in Cancun incorporate rescued fan corals ripped off reefs by storms (top left, center); Sea urchins clean the sculptures each night (above, lower left)

design for the following sculpture.

X-RAY MAG: Many of the sculptures are meant to support coral growth. How has it developed on your sculptures in the various locations?

JDT: Most of the sculptures are



Seahorse on figure, Moliniere Bay, Grenada



THIS PAGE: Fish feeding and schooling around figures of *The Silent Evolution*, MUSA Collection, Cancun/Isla Mujeres, Mexico; Algae and coral growth on night photo of figure, Grenada (right)

designed to support marine life and provide a platform for corals. However, on a select few, I have actually propagated hard corals onto the surface from underwater nurseries and these seemed to have fared fairly well, but after a particularly hot summer in Mexico, I did see a lot of bleaching.

The most dynamic transformation has been in Grenada where great water quality and nutrient-rich current have resulted in some spectacular sponge growth.

The marine life is of course very endemic to the location. Techniques that work in one place may not work in another place. I am currently working on a project in the Canary Islands where the water is much colder. The plan is to make an underwater botanical garden with architectural features, walls, archways and trees. The coloni-

sation is different—it won't be inundated with organic material, not like in the Caribbean where algal growth is faster. It's a lot slower in development, and indigenous species of sea urchin are being threatened by a newer invasive species.

In the past, I replicated sculptures, because I knew that the marine life would quickly colonize and change pieces. But here, there will be many more one-off pieces.

X-RAY MAG: I am sure you will be curious how it all will look after 5-10 years.

JDT: I will be curious after six months! There are so many works in so many places now it's a fulltime job just documenting the work. I would love to retire at 50 and just travel around photographing the pieces.



The Dream Collector (2009), Depth 8m, MUSA Collection, Cancun/Isla Mujeres, Mexico



Solar Man in Brazil has solar panels and solar lights and goes up and down with the tides



The Silent Evolution (2012) above, with 450 figurative pieces, and The Gardener (2009) at right, with staghorn coral growth, are part of the MUSA Collection in Cancun/Isla Mujeres, Mexico

X-RAY MAG: *Did you have any idea it would get so big when you started all those years ago back in Grenada?*

JDT: No, definitely not. It was actually the first time in my life that I did not have a long-term plan. I got to a point in my life where I did not want to worry about the future anymore and just decided to focus on what I was best at and enjoyed.

X-RAY MAG: *You have said that you want people to come away from your sculptures with a feeling of seeing the world in a different way, perceiving the tiny part we are in the grand evolutionary scheme of things... What do you want to wake up or inspire in the minds of the humans who partake of your work?*

JDT: I have been diving and travelling for over 20 years now. Over that time, I have seen habitats disappearing, getting worse across the board in numerous

destinations. I talk to fishermen, locals and divers, and they all say the same thing, "You should have seen this place 30 years ago. It was paradise."

We inhabit this is incredibly beautiful planet and are slowly ruining it, but we still have an opportunity to safeguard its future, and that's the message that I try to convey.

X-RAY MAG: *You've had some extensive international media coverage of your work and projects. Has this helped or hindered your mission or message?*

JDT: Mainly, it's helped. Obviously, I am working in areas where tourism is a major part of the economy, in places desperate to be noticed in a very competitive market, so it has helped me in that respect. It also helps to change the identity of place. In Cancun, for example, we wanted to alter how it was perceived as just a party town. Art, culture and environment were not words you



heard often in association with Cancun, but that has now started to change. The world needs more sustainable tourism. □

*For more information, visit the artist's website at: **Underwatersculpture.com***