ADVANCED DIVER MAGAZINE

ISSUE 11

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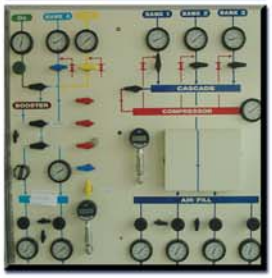

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Publisher's Notes

September 11th not only created hard times for most of the world's economy, but it affected the diving industry as well. Much of the needed dollars that were expected at many dive resorts, live aboard and local dive facilities fell short of their mark.

In December of 2001, things seemed very grim, and many divers were tightening their belts for a possible long winter's nap. The dive boats and sites I traveled to had few paying divers.

January found a new light as the world's militaries took the upper hand. At my visit to Grand Cayman, I discovered those at Cobalt Coast Resort and Divetech with a "glimmer in their eye" as the first full load of divers filed into their resort. Cruise ships seemed to be filling up and the whole island was bustling with diver activity.

On a visit to north Florida caves, Cave Excursions in Mayo, which is owned by Bill Rennaker, was overrun with eager cave explorers, instructors and new students. Bill had his typical smile on his face as divers fiddled with their new equipment, filled doubles and talked about cave diving.

On a trip down to the Florida Keys, Captain Mike of Tavernier Dive Center ran his 45-foot vessel "The Shadow" out twice a day with a good-size load of eager divers on vacation from Massachusetts. Mike was in renewed spirits as he said his calendar was quickly filling up for the summer dive season.

Things are up and moving here at Advanced Diver Magazine. Our staff of writers and photographers is as busy as ever. Subscriptions, retailers and advertisers are up, and I have several new and exciting expeditions brewing in the works for the summer. All in all I feel 2002 is going to be one of the best dive seasons ever, so…

Get off your butts, dive, travel and explore!

Curt Bowen
Publisher ADM

What, you're not in the water yet!

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Cover: Rare Stalked Crinoids on the Cayman wall at 800 ft. / 245 m. Photo Curt Bowen

Fossil records shows Stalked Crinoids date back during the late Cambrian period, over 550 million years ago. Rediscovered in 1972, Stalked Crinoids live only below 650 feet and attach to the sea bottom using attachment structures located at the end of the stalks. The stalk leads up to what is known as the calyx, which is the base of the pentameral system of feeding arms. The feeding arms have ciliated grooves, called ambulacral canals, that capture suspended food particles and direct the food back to the mouth.

Their head or "crown" is made of many arms that contain pinules that catch plankton on a sticky mucus, then it is conveyed to the mouth via tiny hair like projections.

Breaking free from their anchoring points, they crawl with small arms by dragging their stalks.

ANGELITA
Q.ROO H_2S

By Curt Bowen

Located just a few kilometers south of Tulum, Quintana Roo, Mexico, Cenote Angelita appears ordinary from the surface with its circular shape and common vegetation until the water's surface is broken and her treasures below are experienced.

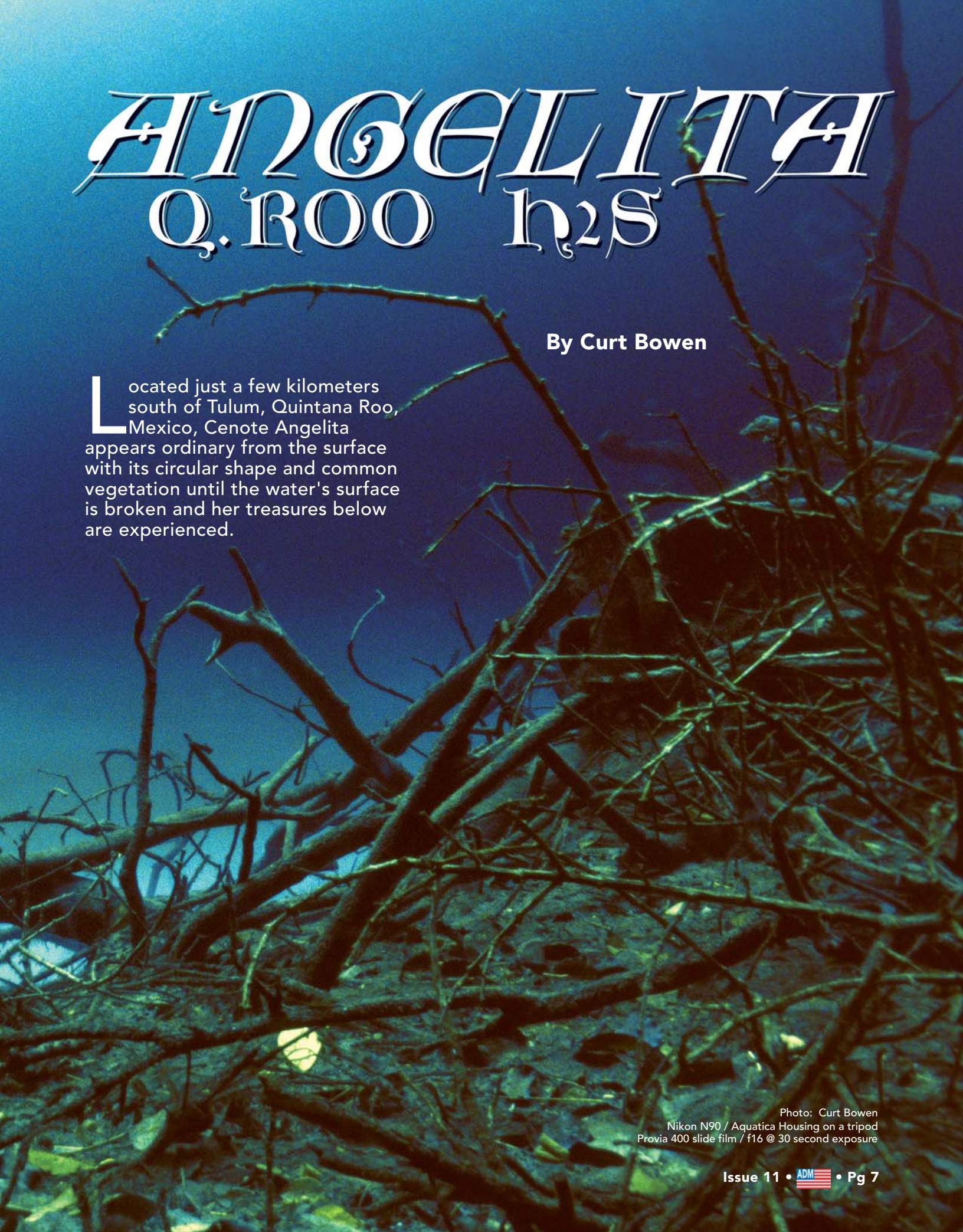


Photo: Curt Bowen
Nikon N90 / Aquatica Housing on a tripod
Provia 400 slide film / f16 @ 30 second exposure

White misty clouds encircle the divers as they descend for the first 50 feet. Like a skydiver dropping through the clouds, the divers descend below this white, misty layer to reveal one of the most unique and mystical views in the Riviera Maya.

Clear water allows unlimited visibility darkened only by the limited amount of sunlight gleaming through the recently broken clouds above. As the divers' eyes adjust to the darkness, steep, pock-marked encircling limestone walls drop sharply into the ground.

Hovering motionless at 70 feet, the unique beauty of Angelita comes into view. Thirty feet below, brown hydrogen sulfide is forever trapped between the lighter freshwater above and the denser seawater below. Undisturbed, this cloud settles into a thick opaque layer that produces an optical illusion of a fake brown sand floor. Emerging from the cloud is the very top of a debris cone entangled with fallen trees and thick, white calcite mineral deposits. The tips of tree branches emerge randomly through the false floor. Like a scene from Sleepy Hollow, one awaits for the headless horseman to charge from the shadows in search of new heads.

Disturbing the hydrogen layer causes wisps of swirling clouds to encircle the divers. From above it appears as if the divers are swallowed into a pit of quicksand -- even their lights are engulfed by the thick hydrogen.

Illustration: C. Bowen
Surface Photo: S. Russ

Top Left: Surface shot of Cenote Angelita.

Left: Illustration of Cenote Angelita. Note the heavy hydrogen sulfide layer just below the top of the debris cone.

Below: Diver swims just above the cloudy hydrogen layer at a depth of 98 feet.

Photo: Curt Bowen
Nikon N90 / Aquatica Housing on a tripod
Provia 400 slide film / f16 @ 15 sec exposure

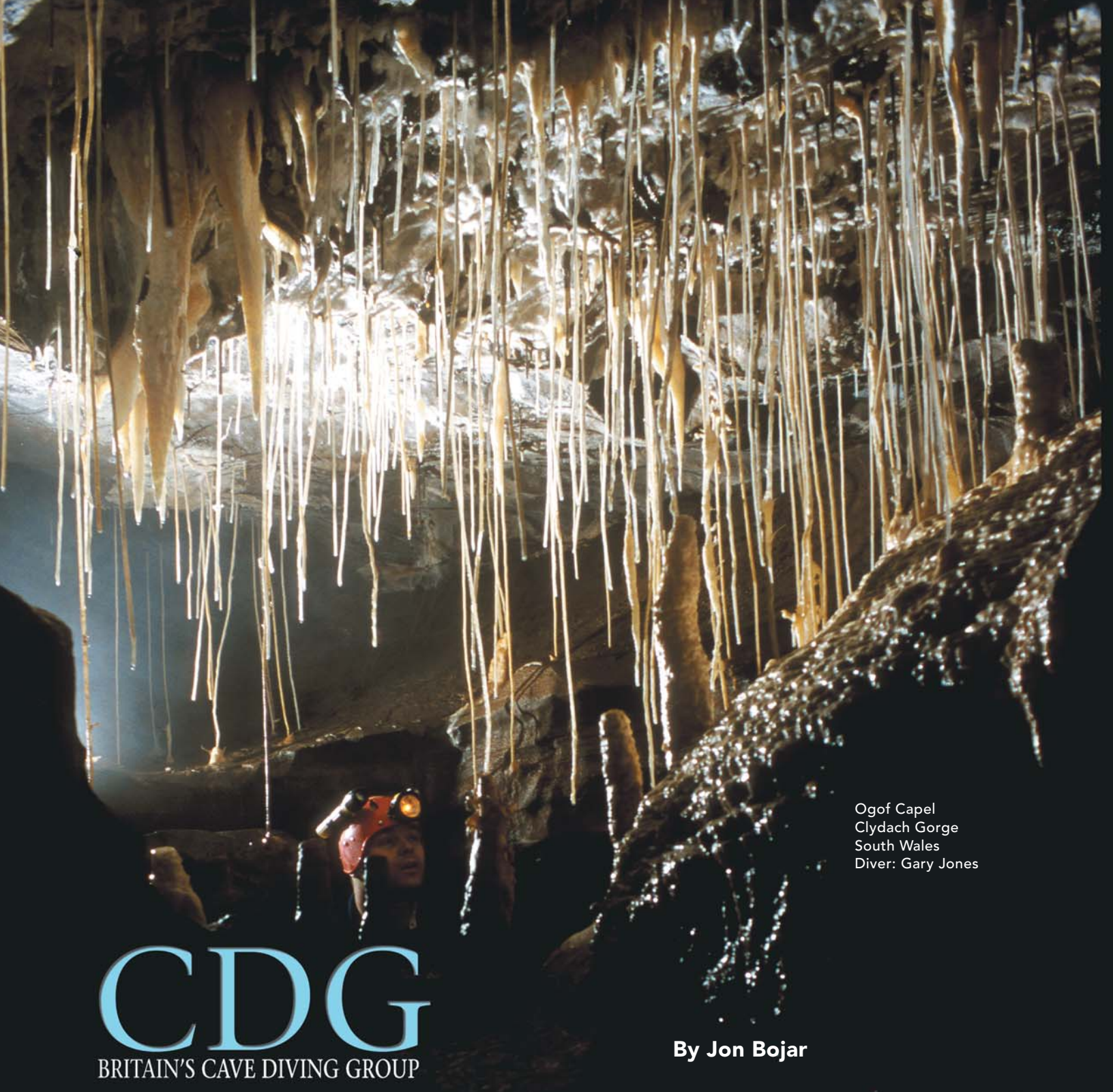
Slowly dropping into the hydrogen layer, the divers' bodies disappear as they are surrounded by the false floor. With the hydrogen layer a dark brown color, the divers' bright cave lights become dim and seemingly useless. Dropping into the darkness for another 10 feet, the light slowly becomes brighter and brighter as the hydrogen cloud thins out and the divers enter the seawater below.

Emerging below the thick hydrogen sulfide cloud, a pungent taste and smell of rotten eggs can be sensed. The tree-covered debris cone descends deeper into the darkness below. Following the cone downwards the shapely walls come into view and intersect with the floor at a maximum depth of 203 feet. From the depths, if the divers turn out their lights, they can see a very faint brown glow with some reds and yellows churning as their bubbles break through the hydrogen clouds above.

Returning towards the surface the divers emerge from the hydrogen tomb below. The brown gas seems to cling to their bodies as they ascend upwards. Following the walls upwards, giant flowstone formations and steep undercuts are encountered between 30 and 10 feet. Exploring the circumference at this depth, small freshwater tunnels that are too small for exploration dart outwards and under the surrounding Mexican jungle. Running water and heavy mineral deposits stain the limestone making a majestic rock painting from nature.

Years ago divers discovered some Mayan pottery at 150 feet and Cenote Angelita was a well kept secret until some of the pottery disappeared. INAH, Mexico's federal archaeology agency, closed the site and performed an investigation and excavation, leaving the dive site without the pottery but still with all its unworldly beauty.

Angelita is a guided dive location only with landowner permission. Gate keys and a small entry fee is required before diving.



Ogof Capel
Clydach Gorge
South Wales
Diver: Gary Jones

CDG
BRITAIN'S CAVE DIVING GROUP

By Jon Bojar

So when exactly was it that enough people thought diving into water-filled passages (with very questionable equipment) was a good enough idea to form a club? It was in 1946 when the Cave Diving Group, better known as the CDG, was formed at the resurgence of Ogof Ffynnon Ddu in South Wales by the late Graham Balcombe. This makes it the oldest surviving diving club in the world! The CDG's origins can be traced back to the 1930s in the Mendip hills of England where the first recorded cave dive was made in Wookey Hole. This cave, part of which was made into a commercial show cave in the 1920s, is considered the birthplace of cave diving.

While there have been numerous dives into caves using the Hard Hat style apparatus (1878 -- dive into the Fonaine de Vaucluse), it is fairly safe to say that cave diving was born in the subterranean River Axe. On February 17, 1934, Graham Balcombe and Jack Sheppard carried a homemade respirator to a sump at the end of a cave named Swildon's Hole on Mendip. Although they failed in passing the sump, the objective was to push the sump, which had helped increase

exploration since 1921. The homemade respirator, made of bicycle parts, was portered through the cave, which was the deepest British cave at that time, past two wet pitches to the sump. It took these pioneers another two years to pass this sump, but the seeds of cave diving were sown that day.

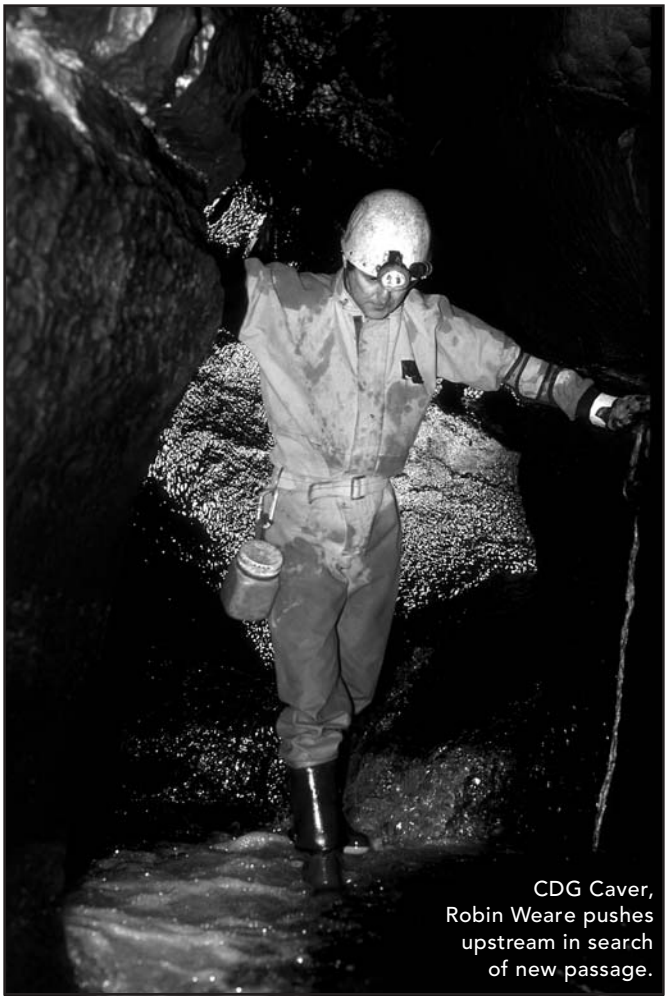
In 1935 these same explorers mounted the Wookey Hole Expedition. Using base-fed air lines and bottom walking technique, they were able to pass the sump in the Fourth Chamber to find the Fifth, Sixth and Seventh Chambers. In November of 1936, Graham Balcombe made the next crucial step in the development of cave diving. Using his homemade bicycle respirator, he attached an oxygen cylinder and passed Sump Two in Swildon's Hole. In doing so he became the first self-contained cave diver. As it turns out, the Swildon's stream feeds the River Axe, which rises from under Mendip at Wookey Hole. In the years following World War II, the River Axe became the cradle of the Cave Diving Group. It was in April of 1946 when Balcombe and Sheppard turned their attention to Ogof Ffynnon Ddu in South Wales. While the great cave hiding upstream was not to yet reveal itself, the two succeeded in recruiting several cavers to the cause. The Cave Diving Group was formed, coordinated on a regional basis with 3 sections: Somerset, Welsh and Derbyshire. Since then, the CDG has become known throughout the world as one of the best sources of sump diving knowledge.

Today the CDG has its own training (apprenticeship) and examination system, although is not an accredited certifying agency. Cave diving in England is not so much a branch of technical diving, but more a form of technical caving. The nature of operations beyond sumps requires the cave diver to be proficient in all aspects of underground exploration: climbing, rope-work, surveying, digging, photography and particularly first aid. Being both underground and underwater doubles the skill set required to safely negotiate a sump and continue cave exploring. The British cave diver tends to be motivated to discover new cave passages and is highly self-reliant. Membership of the CDG has always been drawn from the caving community, because U.K. cave diving is effectively caving underwater, more so than diving with a roof over one's head. Due to the caving skills required to safely dive sumps, the training regiment has several levels. Traditionally, the potential member will have at least two years of caving experience, a minimum of BSAC sport diver or equivalent certification (this is the norm), find a proposer and seconder (both of whom are qualified diving members) and then the section will vote on your membership. Depending on your skill level and experience, you would be voted into one of the qualification levels:

• Non-Diving members: This category is typically meant for members resident abroad.

• Probationary Trainee: One who doesn't hold a recognized diving qualification (BSAC, etc) and hasn't passed the pool test would fit into this level. This phase is aimed at producing an individual competent in the use of SCUBA.

Caver explores going streamway passage.
Grotte De Gournier
Vercors, France
Caver: Damian Weare



CDG Caver, Robin Weare pushes upstream in search of new passage.

• Trainee Diver: This level is for those training for actual cave dives. The use of side-mounted cylinders, line laying and other overhead techniques are taught. The trainee diver progresses to actual cave dives (under supervision).

• Qualified Diver: The Qualified Diver has passed an Advanced Test with an examiner from their section. Qualified Divers are full voting members of the Group and are eligible for election to the post of Examiner by the section; normally, only enough Examiners are appointed to satisfy the demand for Pool and Advanced tests.

In order to move up to the next qualification level, one must be voted upon. This gives all members a chance to voice potential concerns over a new member's skills or general attitude. While it may seem excessive, the safety record of the CDG is quite impressive, especially considering the general conditions of sumps in England and Wales.

The CDG is administered nationally via a central committee, but the divers belong to one of the four sections: Derbyshire, Northern, Somerset and Welsh. The section one joins would reflect the area in which their caving/diving is primarily conducted.

Having mentioned that the CDG is not a recognized certifying agency, they are also more than what we would normally consider a 'club' in the United States. When looking at the contents of the CDG training manual (which all members must have), one will see everything from openwater skills to long-distance sump diving and passing through tight sumps. Caving beyond the sump and first aid beyond long sumps is also covered. In the equipment section there are boot suggestions (for caving after the sump) and compressor information (there are few fill stations available). Underwater digging, DPVs, rebreathers and survey techniques are also listed in the manual. During the Wakulla II Project, membership in the CDG as a Qualified Diver was said to be the highest certification level possible. This, perhaps, puts the nature of the CDG training in prospective.

This is not to say that formal technical diving certification training is not available in the UK. In fact, technical diving certifications have recently gained in popularity. TDI, and to a lesser extent IANTD, have been available although not used by mainstream cave divers in the past. This is typically due to the fact that the techniques necessary to dive many of the sumps and to reach the second, third and further sumps are not available in this training. There are sidemount/sump specialists, such as Martyn Farr, who offer training in these disciplines, but in general the skills are developed within the CDG itself.

Global Underwater Explorers (GUE) UK has recently established itself, which teaches the D.I.R. (Doing It Right) principle developed by the WKPP in Northern Florida. Agencies of this nature teach mainly resurgence -- or spring cave diving -- where caving beyond the sump is not an issue over which to be concerned. This training focuses more on long range and deep diving techniques than on sump/caving skills.

The future of the CDG likely resides in a combining of the two techniques. This is not implying that all sump divers will become long range deep cave divers nor vice versa. Instead, the CDG is faced with adding a new facet of technical divers into their membership. This would mean having non-caving members in the CDG. This is somewhat controversial, as the CDG was formed by a group of cavers' desire to pass sumps in exploration of passage, which would otherwise elude them. Cavers became cave divers out of necessity, not the other way around. The reasoning behind this is fairly obvious. If one is to participate in an activity as dangerous as sump diving, that person should prove himherself competent in the more forgiving world of a dry cave. It should be pointed out that while the CDG typically focuses on cave exploration and survey and not on long range deep cave diving, there are a few members who excel at both. Many of the deep caves found in Southern France and Spain have been pushed by CDG members using rebreathers and long range scooters.

Brief History

1935 Balcombe and Powell reach Chamber Sseven, Wookey Hole, using Standard Equipment.

1936 Sumps One and Two, Swildon's Hole, passed using homemade respirator (made of bicycle parts and oxygen cylinder) and a homemade drysuit.

1945 Kelt Head is explored using oxygen rebreather apparatus.

1946 First dives at Ogof Ffynnon Ddu lead to the formation of the CDG!

1957 SC Nitrox rebreather is used to push Wookey. Suit inflation in drysuit is developed.

1960's Open circuit compressed air gains widespread acceptance. Introduction of wetsuits and fins (previous dives were made bottom walking).

1970's Long sump pushes in Kelt Head, Wookey and others. Many tragic deaths occur during this time frame.

1980's Long deep dives become possible with the re-introduction of the dry suit and experimentation with mixed gas.

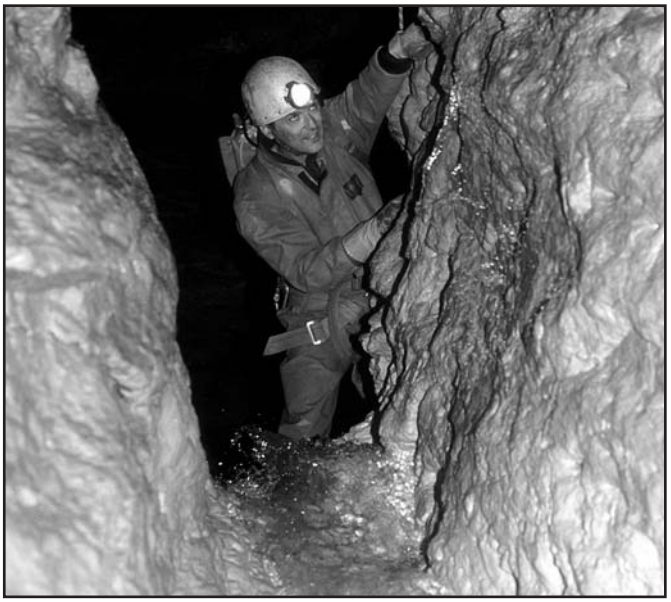
1990's Mixed gas gains slow acceptance. Rebreathers begin to reappear. Underwater digging becomes common.

2000 Using redundant rebreathers and long range scooters, huge systems are pushed (Ressell, Doux de Coly, St. Savuer, etc).

The history behind the CDG and, in effect, the creation of the discipline of cave diving itself is filled with great pioneers. So many, in fact, that to even briefly mention all the notable accomplishments would take a small book. Their attitude and mindset to overcome obstacles is apparent. It is this spirit that drives the future. More than anything this is what needs to be carried forward. The Cave Diving Group, the oldest of all diving clubs in the world, will continue to produce pioneers of tomorrow.

For further information on the CDG or cave diving in England. **www.cavedivinggroup.org.uk**

Special thanks to Tim Morgan, Duncan Price, Rick Stanton and to all members of the Welsh Section of the CDG.



VR3 Mixed Gas Dive Computer

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Ocean Management Systems anounces the release of the new VR3 Mixed Gas Diving Computer.

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• PIN number system to allow user reprogramming
• Decompression Games (to help pass the time)
• 99 levels of decompression
• Links to most rebreathers for on-line decompression
Upgrade path available for existing VR3 users

Introduction

The VR3 is designed as a multi-gas, multi-mode decompression computer. It is available in a variety of configurations - from a simple air and nitrox unit through to a full, mixed gas open and closed circuit system. The basic options are:

- Open Circuit Air and Nitrox
- Open Circuit Air, Nitrox and Trimix / Heliox
- Closed Circuit Nitrox
- Closed Circuit Nitrox, Trimix / Heliox

The VR3 is designed to integrate with both the Proplanner decompression software and the Prolog dive logging system. It is fully re-programmable should the diver choose to upgrade between options or if new technology / physiology become available.

Decompression Algorithm:

The VR3 uses a derivative of the Buhlmann ZHL 16 algorithm. Exactly the same adaptation is used in the Proplanner decompression software.

The new versions of both systems employ some of the latest thinking in microbubble avoidance. They may seem to modify the dive profile compared with standard parallel compartment models. The modification takes the form of deepwater microbubble controlling decompression stops. In certain circumstances the VR3 will prompt the diver to do a short decompression stop, or stops, well below the bulk of the decompression sequence. Along with other modifications to the remaining profile, this helps reduce the problems associated with potential microbubble growth.

Alarms

The VR3 has several on screen alarms indicated by on screen messages and the backlight flashing.

Decompression Stop Violation

If the diver should ascend past their required decompression stop depth the descend arrow appears on the screen. If the warning is ignored, after 60 seconds a message will appear which says "USE TABLES". After this the VR3 will still provide best guess decompression data but should not be relied upon. If the diver recorrects their depth before a 60 second violation the timer will start back up again.

Switch

Based on the dive plan entered by the diver, the VR3 will prompt for a gas change when the depth has been reached. The diver may ignore this if they wish and carry on with the same gas.

PO2

A PO2 alarm occurs when an open circuit gas or diluent has exceeded 1.6 bar.

Air Break

This alarm will display when the user set CNS alarm limit is exceeded.

VR3 Review by Robert Powley

When I was asked to review the new VR3 from Delta P Technology and distributed by Ocean Management Systems in the United States, I had a hard time determining where to start. So, I decided to go back to when I was first considering buying a dive computer. As a new diver, I quickly learned that there were many dive computers offering many different features. I spoke to experienced divers, instructors and friends, and the sum experience was confusing and sometimes overwhelming. Now, as an instructor who owns too many computers, I firmly believe that a computer should be purchased with your diving future in mind and not limited solely to your current level of diving. With this as a guide, if you are interested in technical diving and believe it is the direction that you will pursue, the new VR3 may be the last computer you'll need to own.

The VR3 is offered in four different versions, starting with Open Circuit and Nitrox and culminating with Closed Circuit Nitrox and Trimix. However, the base level computer can be upgraded to more advanced levels as a diver's training and experience grows. The computer can also be upgraded within a specific level to add new features or to incorporate the most current decompression algorithms. Additionally, the VR3 can be upgraded to include a rebreather link, which provides for direct analysis of the gas in the breathing loop, enabling more accurate decompression analysis and redundancy to existing onboard electronics. The unit even employs an altimeter for accurate sensor calibration during your pre-dive safety checks.

Apart from the ability to be upgraded, the new VR3 is independently a significant upgrade from the original VR3, even though many of the features remain. I used the original VR3 the last two years and enjoyed its application to Trimix and Closed Circuit dives. However, the original VR3 was not good on battery consumption, was relatively large and did not have an automatic activation in water. The new VR3 is improved in all these areas and many more. The new VR3 is in a well-built metal housing and the buttons are very easy to operate, even with heavy gloves. The new version is at least half the size of its predecessor and automatically activated by depth. The screen on the new VR3 is easier to read and the backlight is a much-improved, battery-friendly, blue light. Furthermore, the unit is powered by one user replaceable, ultra available, AA battery, which without the backlight, provides 100 hours of operation. The computer also provides complete dive planning, which takes into account actual tissue saturation of the diver, providing the ability to write back-up tables without having to bring your laptop.

As found in the original VR3, the new VR3 retains the ability to be switched between 10 gases and from closed circuit to open circuit during a dive. Even though back-up tables must always be carried, the VR3 can continue to analyze a dive based on the actual gas in use during an emergency, and therefore, can provide the fastest safe way out of the water. The new VR3 also provides a detailed description of all decompression stops during any point in a dive, including time to the surface, and not just the first or current stop. Furthermore, the new VR3 stores a graphical dive profile in the log for great post-dive analysis.

Finally, I cannot forget to mention the game feature, which is designed to help pass the time during long decompression stops. There are many features not discussed in this review, but the new VR3 should merit serious consideration by any technical diver. Quite simply, the new VR3 is an amazingly well-conceived dive computer, which is a significant improvement from the original.

Paddlewheel Wreck
Naples Florida

Text and Photography by Jim Rozzi

Several 200-500 pound Goliath Fish (Jewfish) make the Paddlewheel their home.

Not too far from the City of Naples in Southwest Florida lie the remains of an old wreck. The sand bottom at a depth of eighty feet is littered with twisted pieces of metal, large gears, steel pipes, and hundreds of oversize bricks. The bricks are unique in that they are about twice the size of modern construction bricks.

The local divers commonly refer to the wreck as the Paddlewheel. From the large quantity of bricks and the wreck's location, it appears that the ship's cargo was perhaps headed one hundred miles South to Fort Jefferson in the Dry Tortugas. Construction of the fort began in 1846 and required the use of sixteen million bricks. The fort's outer wall is eight feet thick, fifty feet high, and one half mile long. It is all made of brick and the bricks are similar in size to those found at the wreck site.

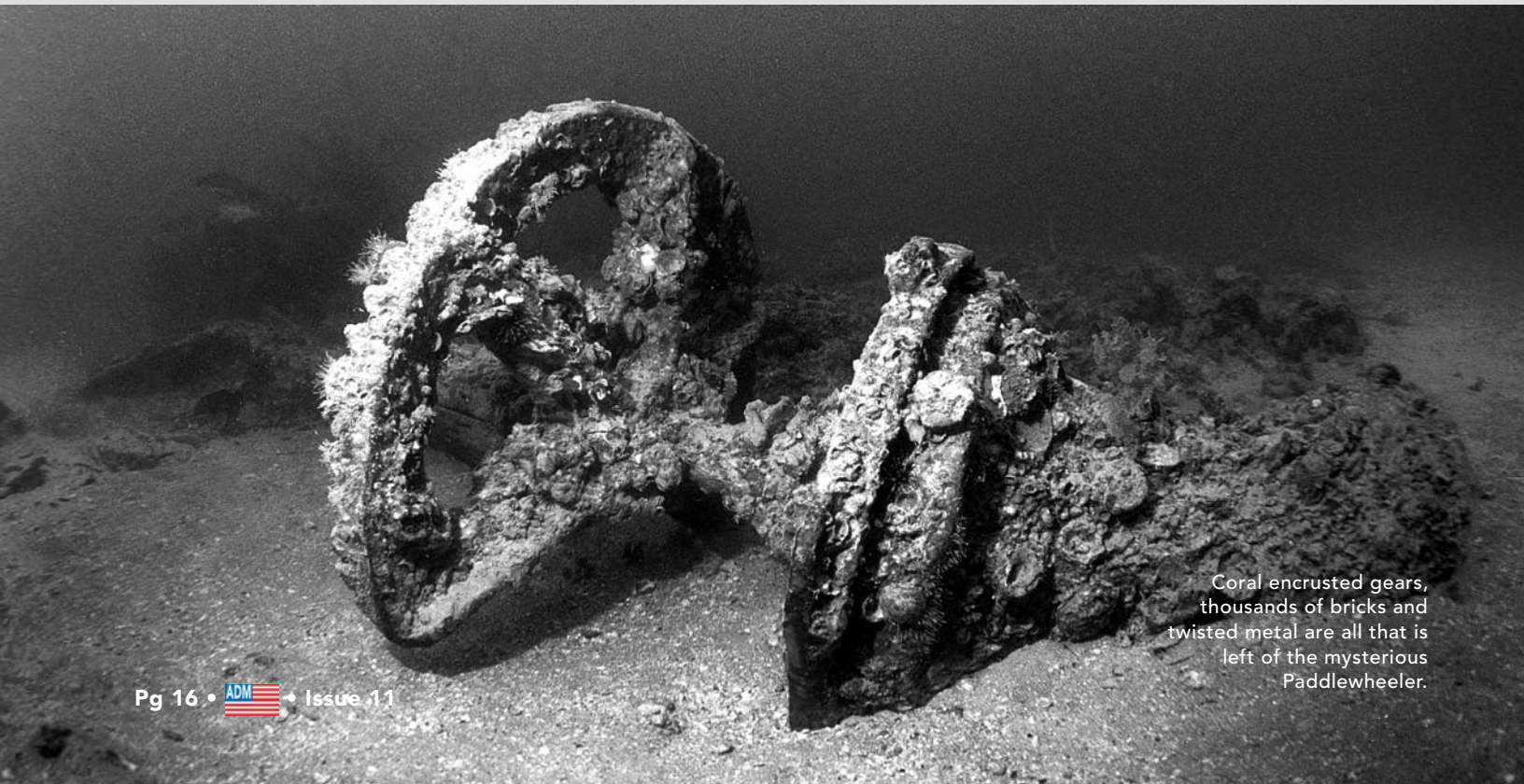
The wreck's steel beams and pipes are covered with marine growth that includes colorful sponges and oysters. Many varieties of snapper swim around and into the tubes of the remains of a boiler or heat exchanger.

Three hundred pound Jewfish lurk near the large steel beams, shaft, and gears, which may have been part of the paddlewheel propulsion system. In the distance are seen retreating black groupers who await the diver's departure from the wreck site. This section of the wreck is located about seventy feet away from the heat exchanger.

Large commercial fishnets left behind by hapless shrimpers drape portions of the wreck. The resident seven-foot nurse shark has been cut out of these entanglements on more than one occasion.

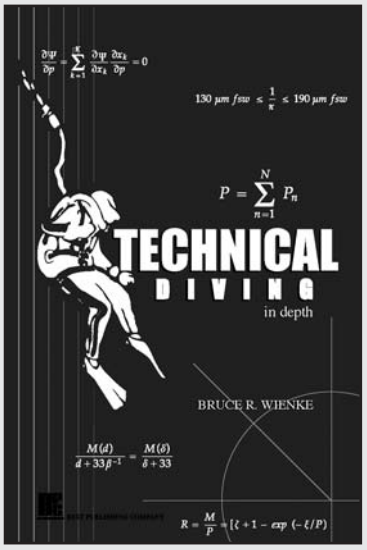
On the day of our January dive the water was crystal clear and a magnificent dark blue. Visibility was eighty feet. Large schools of Atlantic spadefish circled the anchor line on our descent. Bottom visibility was in the range of twenty feet. The wreck's coordinates are N 250 53.32', W0810 17.52'. Water temperature was 75°.

If you have any more accurate information about the history and identity of this shipwreck, please send the information to Advanced Diver Magazine.



Coral encrusted gears, thousands of bricks and twisted metal are all that is left of the mysterious Paddlewheeler.

DIVE BOOKS



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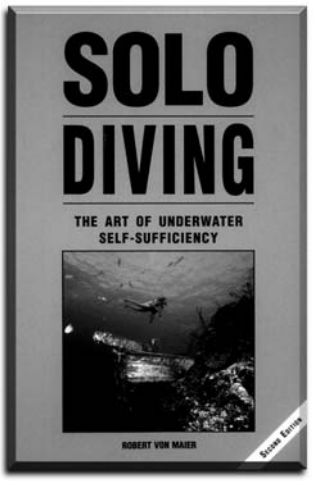

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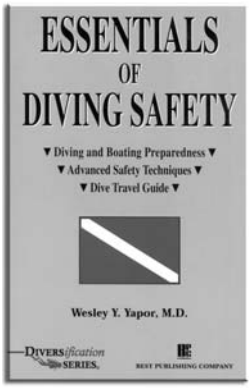

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By Robert N. Rossier

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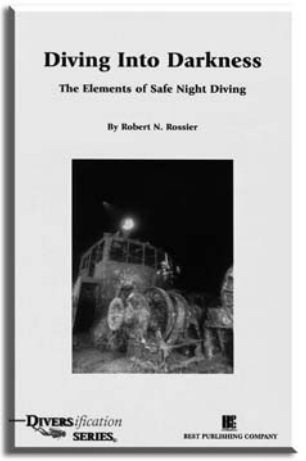

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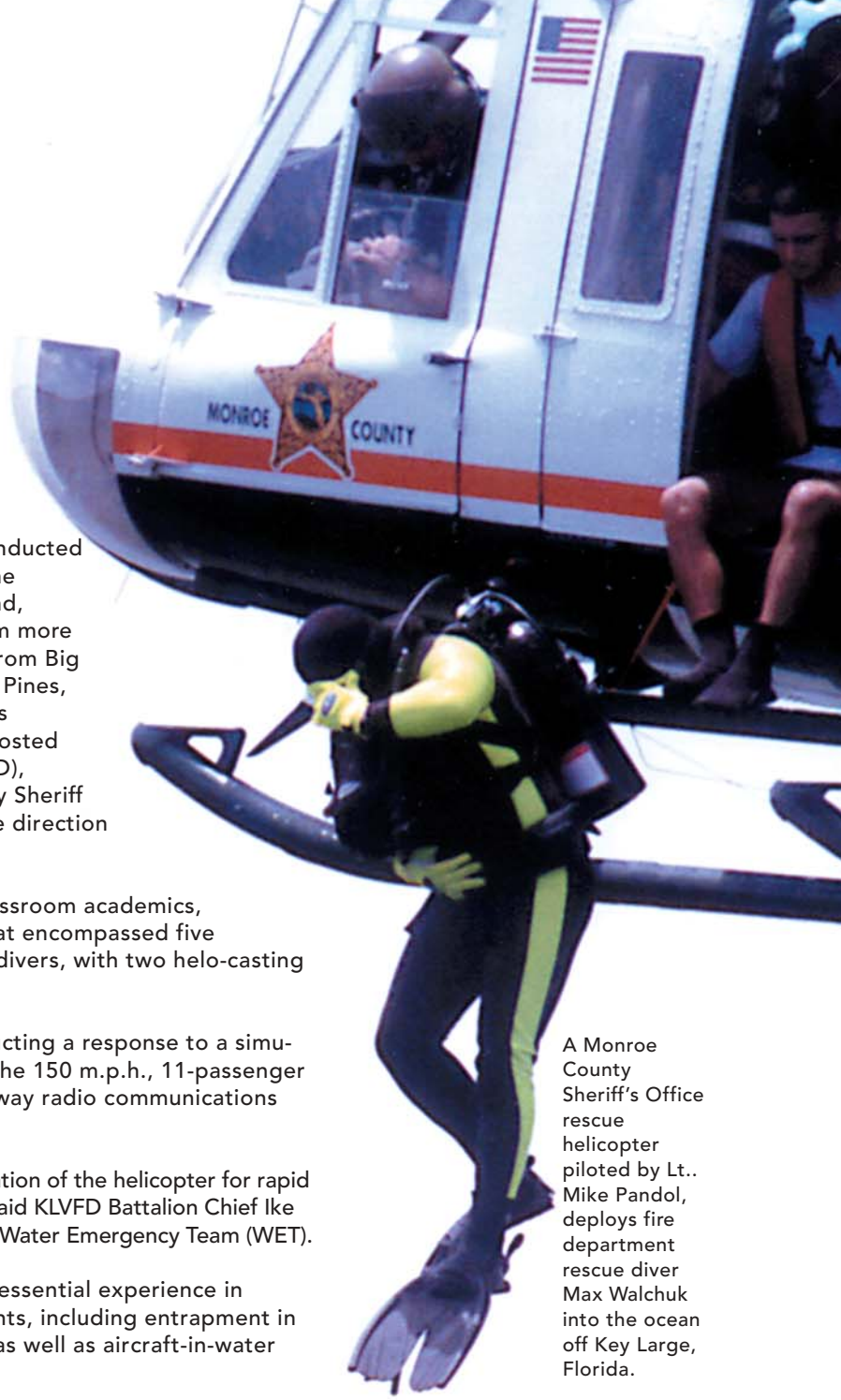

A Monroe County Sheriff's Office rescue helicopter piloted by Lt.. Mike Pandol, deploys fire department rescue diver Max Walchuk into the ocean off Key Large, Florida.

In the summer of 2001, water-rescue teams conducted an advanced-ocean helicopter deployment off the Florida Keys. In one of the largest drills of its kind, more than three dozen rescue-equipped divers from more than 11 municipalities, including fire departments from Big Pine, Islamorada, Tavernier, Big Coppitt, Pemproke Pines, Ft Lauderdale and Monroe County EMS and Sheriffs entities, participated in this interagency training. Hosted by the Key Largo Volunteer Fire Department (KLVFD), helicopter support was provided by Monroe County Sheriff Richard Roth, via office's aviation division under the direction of Lt. Michael Pandol.

The nine-hour multilevel operation included classroom academics, theory, practical demonstrations and operations that encompassed five deployments. Each deployment consisted of eight divers, with two helo-casting from the aircraft simultaneously.

The mission behind the training involved conducting a response to a simulated multiple victims in distress in the water call. The 150 m.p.h., 11-passenger UH-1H rescue helicopter maintained constant two-way radio communications during the exercise.

"This is a superb example of the advanced application of the helicopter for rapid deployment of team during a large-scale operation," said KLVFD Battalion Chief Ike Beal, dive officer and coordinator of the department's Water Emergency Team (WET).

"It's important that we are able to acquire the essential experience in effecting rescues for people-in-distress type incidents, including entrapment in overturned and/or submerged boats and vehicles, as well as aircraft-in-water emergencies," noted Chief Beal.

Max Walchuk, invited to attend by Chief Beal, has been a member of the Chicago Fire Department's helicopter-based rapid response scuba team over the past decade. This event was held to establish common standards for rescue scuba team deployment throughout the Florida Keys.

In addition to the helicopter, the Sheriff's Department provided a wave-runner patrol which formed an integral part of the water safety teams, along with two, ridged-hull inflatable boats that were provided by KLVFD Chief Garcia.

"Everyone performed to a "T", pure and simple. It was multi-jurisdictional cooperation at its best," said Walchuck.

Sting of the Scorpionfish

Text and Photography by:
Tom Isgar

Every advanced diver has had this "near miss" experience. While watching a colorful reef fish or swimming by a spot in a wreck or taking a photograph, a Scorpionfish moves away from a diver's outstretched hand as he or she reaches for support. While the experience makes an interesting story above water, actual contact with a Scorpionfish could lead to very serious injuries. (See the sidebar for a recommended treatment for Scorpionfish stings.)

Because they are dangerous and hard to find, a Scorpionfish sighting is always exciting. While they may be fairly common, few divers see them.

FAMILY

Scorpionfish are in the Family Scorpaenidae.

This is a large family, consisting of seven to 10 subfamilies (it depends on which author you read), 45 to 96 genera and 353 to 544 species. The three subfamilies that are best represented on coral reefs are the Scorpaeninae - scorpionfishes (over 150 species), the Pteroinae - lionfishes (with 17 species) and the Synanceinae - stonefishes (with 10 species). The last subfamily, the stonefishes, includes the most venomous fish in the sea.

DESCRIPTION

Scorpionfishes are generally heavy in front with large, wide mouths. They appear wider than they are deep, thus allowing them to blend with the bottom rather than stand out. The size of the Scorpionfish varies with the specific species, but in general the fish are three to 12 inches with a maximum circumference of 20 inches. Many of the smaller Scorpionfish reside in caves and crevices and are rarely seen.

Ambon Scorpionfish

Web Sites
aqua.org
aquariums.state.nc.us
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coralrealm.com
dfg.ca.gov
fishbase.org
oceantropics.com/fishfacts

All Scorpionfish are protected by three to 7 spines beginning at the base of the head, followed by 11 to 17 dorsal spines running along the back with another 8 to 17 softer spines, which can also sting. Many also have anal and pectoral spines capable of penetrating the skin. Most Scorpionfish have large pectoral fins that resemble wings when spread.

The sting from the Scorpionfish occurs when a spine penetrates the skin. Venom glands at the base of the spines act like pumps and force venom through the spines into the victim.

Most Scorpionfish can be found resting on a firm perch. The perch may be a rock shelf, a sandy bottom, a wreck or the top of a coral head. Even when changing resting spots they stay near the bottom and only move to a nearby spot. Scorpionfish rely on their camouflage and stillness to provide them with food and at the same time protection against predators. They typically adapt their color to the surrounding area. The Spotted Scorpionfish, found in Florida and Caribbean waters, can be nearly white when resting in the sand or on bleached coral and later appear pink or red to conform to a different spot. Regardless of the nature of the resting spot, the scorpion will mimic it. While they will have a dominating color, they are usually mottled with several colors completing their disguise. Many Scorpionfish have skin flaps and tassels growing on their bodies and lips which add to their camouflage. All of these characteristics help them disappear.

Most species live at a wide range of depths (2-400 feet) and most Scorpionfish are easy to approach if you see them. Since they rely on camouflage, they are unlikely to move unless the diver gets too close. Some species may flare their pectoral or their colorful underbody as a warning that they are being disturbed. Some species, which live in sandy bottoms, like the Spiny Devilfish or Ambon Scorpionfish will slowly move away or bury themselves in the sand. The Stonefish will rarely move. Since all of these fish are venomous, it is best to approach them slowly, maintain a distance and observe.

DISTRIBUTION

Scorpionfishes live in all but the coldest global waters. Hawaii has recorded 25 species; Australia has more than 80 species and Micronesia more than 30. Scientists have identified 65 species along the California coast. However, due to the scorpion's excellent camouflage, divers rarely see many of these fish.

The REEF database that has records from both US coasts, the Caribbean and Hawaii reports 18 different species. However, only four of these are reported more than once every 20 dives. The four are the Spotted Scorpion (Scorpaena plumieri plumieri) seen in the Western Atlantic; the California Scorpionfish (Scorpaena guttata) seen in California and north; the Speckled Scorpionfish (Sebastapistes coniorta) seen in Hawaii and the Stone Scorpionfish (Scorpaena plumieri mystes) seen along the Western Mexico and Central American coasts. The Spotted Scorpionfish, discussed below, is most often seen by Florida and Caribbean divers. Its shape and behavior is typical of all but the few exotic members of the subfamily. Several exotics are described later.

U.S. WATERS

The most frequently observed Scorpionfish in Eastern US waters is the Spotted Scorpionfish (Scopraena plumieri). There are several common names for this fish. In Barbados it is called a Lionfish or a Prickly Hind. In Jamaica it is the Stinging Grouper and in Cuba and Central America the Rascasio. The Spotted Scorpionfish is also known as the Stone Scorpionfish. A typical size is 10-14 inches.

The Spotted Scorpionfish is found as far north as New York and south to Brazil, east to the eastern coast of Africa, and in the tropical eastern Pacific, Baja California to Peru, including the Revillagigedos and Galapagos Islands. The eastern Pacific form was once known as Scorpaena Mystes, so is likely that the Stone Scorpionfish found in Hawaii is a close relative of the Spotted Scorpion.

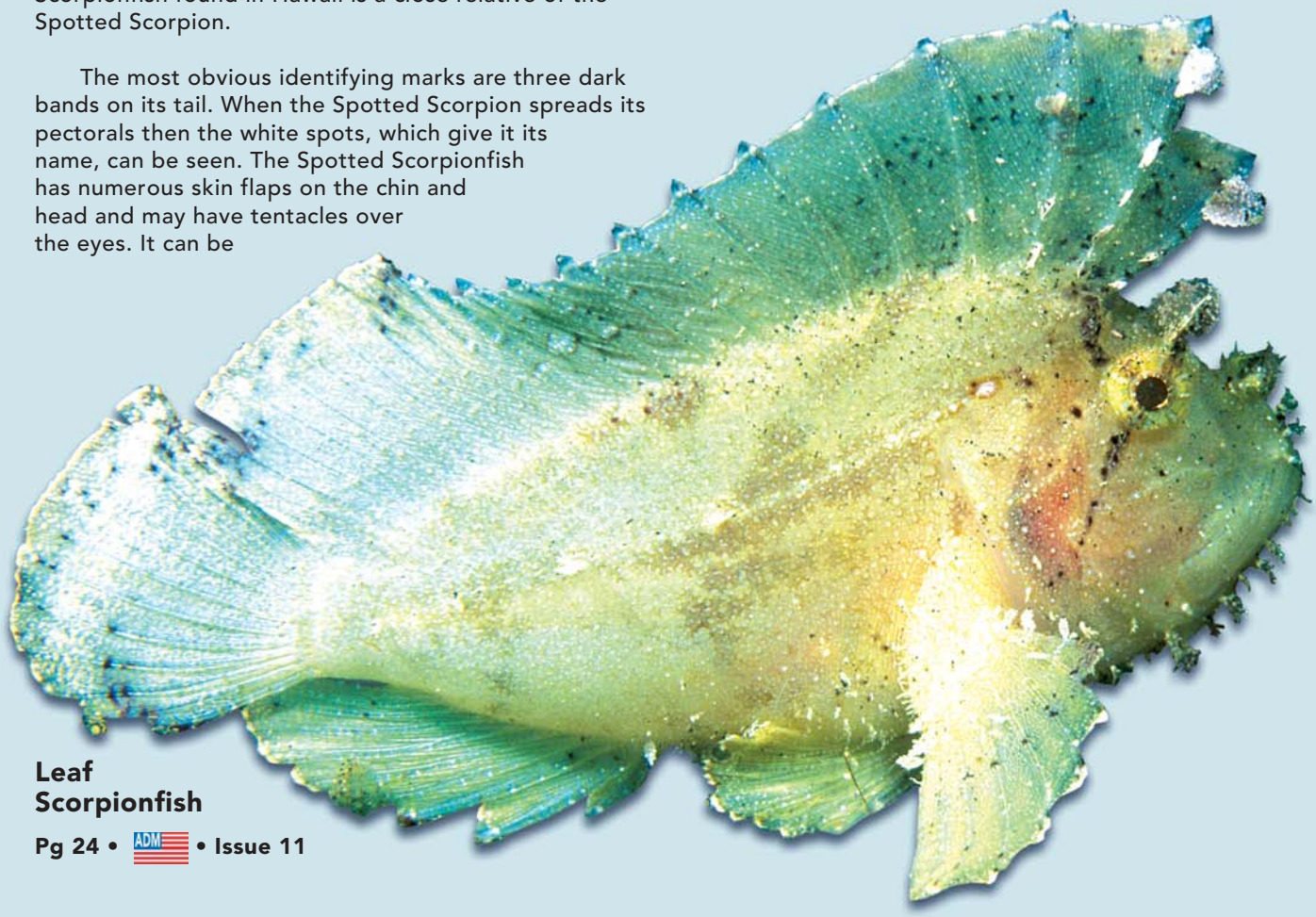
The most obvious identifying marks are three dark bands on its tail. When the Spotted Scorpion spreads its pectorals then the white spots, which give it its name, can be seen. The Spotted Scorpionfish has numerous skin flaps on the chin and head and may have tentacles over the eyes. It can be brown, gray or pink with dark and light mottling of various colors. However, it will almost always blend into the background.

The California Scorpionfish (Scorpaena guttata) resembles the Spotted Scorpionfish. They are found as far north as Santa Barbara, California, and south along the Pacific coast of Baja, California, and into the Gulf of California. These Scorpionfish live from tide pools to depths greater than 600 ft. Tagging studies have shown individuals to travel as far as 350 km. Some of these movements are related to annual spawning migrations that are sometimes extensive.

California Scorpionfish grow to 17 inches and some can live up to at least 21 years. This fish is sometimes referred to locally as a Sculpin. It is one of the few Scorpionfishes that is commercially fished. There are frequent mentions that all Scorpionfish are tasty, "a little like chicken," according to one report.

GLOBAL WATERS

Many of the Scorpionfish around the world resemble the Spotted and California Scorpionfish in shape and behavior. However, there are several exotic Scorpionfish which draw photographers to Indonesia, Papua New Guinea, Australia, Micronesia and the Red Sea that are quite different.



Leaf Scorpionfish

The Tasseled Scorpionfish (Scorpaenopsis oxycephala), sometimes called the Smallscale Scorpionfish, is an attractive Scorpionfish with many colorful skin flaps on its lower jaw and the sides of its head. These skin flaps, or tassels, both camouflage the mouth and at the same time attract small fish. (See photo.) It often sits on the top of coralline boulders, on coral rubble in plain sight waiting for prey. Although this fish is usually solitary, several fish may be seen on the same reef.

When I first photographed the Ambon Scorpionfish (Pteroidicthys amboinensis), I knew I had discovered the underwater Yosemite Sam. However, others had already photographed and named this walking orange fish. Like other Scorpionfish, the Ambon lives in a wide range of depths. While they sometimes live as deep as 600 feet, they are mostly encountered in 20-40 feet on sandy or algae covered bottoms. The one in the accompanying photo was one of a pair. It was a bit larger than the other which may have been its mate.

Its colors mostly fall into shades of orange. The variety of appendages extending from the head is among the most ornate in the underwater world. The large pectoral fins look like a set of independent spines but are actually joined by a clear membrane.

Another of the exotic Scorpionfish is the Leaf Scorpionfish (Taenianotus triacanthus). This attractive member of the Scorpionfish family is known as the paperfish, swayfish and sailfin leaffish in some parts of the world. Swayfish is a good name in that it describes the fish's behavior as it sits on the top of a coral and sways with the current. The Leaf Scorpionfish is small and only attains a length of three to four inches. While many of the Scorpionfish have wide stout bodies, the Leaf Scorpionfish has a narrow body and is shaped like a leaf. Structurally its body is more like a butterfly fish than a Scorpionfish. It is normally a single color although it molts its skin every few weeks, which may account for reports of mottled or bicolor Leaf Scorpionfish. I have photographed black, red, brown, tan, and white individuals. Leaf Scorpionfish are often seen in pairs -- a trait that is different than many other species. While this fish can be found at depths of three to 400 feet, it is usually perched in a protected area.

The Spiny Devilfish (Inimicus didactylus) is a truly weird fish. Its appearance justifies one of its other names -- the Sea Goblin. The Spiny Devilfish is a small Scorpionfish ranging from four to seven inches. It can be found at depths from 17 to 132 feet.

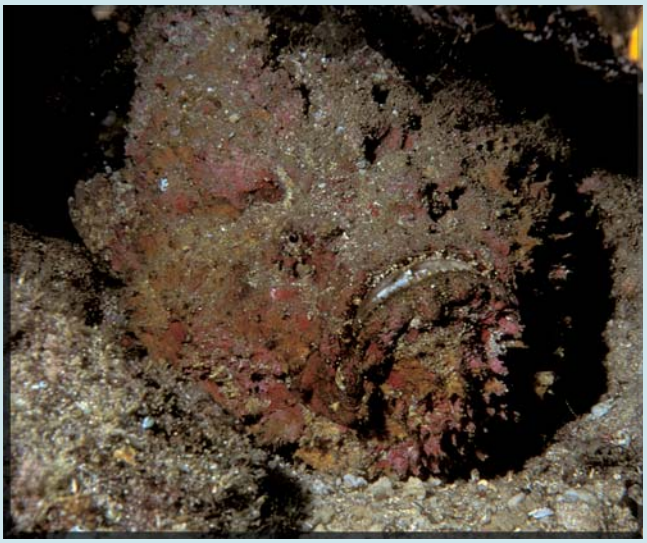
Unlike many of the other Scorpionfish, which perch on the tops of ledges and corals, the Spiny Devilfish lives on the bottom in sand, mud or soft rubble. It buries itself in the sand during the day and emerges at night to hunt.

The Spiny Devilfish looks most like a small bony dinosaur that forgot to leave the sea. With prominent brows, spiky pectoral fins that look like pincers and act as walking legs, and spines that radiate from most of the

Spiny Devil Fish

Spotted Scorpion Fish

Stonefish



body, it is unique. Their colors vary through a range of tans and reds with lighter marking under the pectoral fins. These colors are displayed when the Spiny Devilfish is threatened. (See photo.)

All of the Scorpionfish are venomous and should be treated with respect. However, deaths have been reported from encountering the spines of the Reef Stonefish (Synanceia verrucosa). The Reef Stonefish is known as the Common Stonefish in some areas. The Stonefish is similar in size to others in the family, ranging from nine to13 inches.

The Reef Stonefish will not be found as deep as others in the family. It is usually shallow, 15-30 feet. The Stonefish often sits under overhangs or in the front of small caves. This is good news for divers since it makes it less likely that they will encounter the dangerous spines.

While many of the Scorpionfish have stout forebodies, the Reef Stonefish appears to be all head and mouth. Its colors are mostly brown or black, maybe reflecting their preference for resting under overhangs. They often have nubby skin that add to their disguise.

FEEDING

Most Scorpionfish capture food by waiting for it to swim or walk by. They rely on camouflage and patience. Some species use their tassels (Tasseled Scorpionfish) to lure their prey. The Leaf Scorpionfish has a small lure on its head that it waves above its mouth. This is similar to the way frogfish lure their prey.

Scorpionfish's food varies between species, but crustaceans and fishes are the primary food. When smaller fishes or crustaceans venture near, the Scorpionfish makes a lunge, opening its huge mouth, sucking the pray in. The Spiny Devilfish, buried in the sand, catches prey which gets too close. It is one of the Scorpionfish that are more active hunters at night.

REPRODUCTION

Most scorpionfish have separate sexes with the females generally outnumbering males. Scorpionfish are oviparous, have external fertilization, and females produce eggs imbedded in the gelatinous walls of hollow, pear-shaped egg-balloons. The egg masses float near the surface until the eggs hatch.

California Scorpionfish make extensive spawning migrations in late spring and early summer, when most adults move to 12 to 360 foot depths and form large spawning aggregations on or near the bottom. During spawning, these aggregations rise up off the bottom, sometimes approaching the surface. Spawning occurs in the same areas year after year.

DEFENSE

Fish have several means of defense, camouflage, protective spines, coloration, electric shock and chemicals. The Scorpionfish relies primarily on camouflage. Its color and color patterns change to match the resting spot. Their large eyes are often shaded by flaps of skin or tassels that break up the eye outline. However, when this fails the Scorpionfish can use its spines as offensive as well as defensive weapons.

There are venom glands that are associated with the fin spines. As the unfortunate victim presses down on the spine, the base of the spine pushes against a venom sac forcing the venom upward through the spine and into the victim.

The primary predators for Scorpionfish are sharks, rays and large members of the snapper family (lutjanidae). Octopi prey on small individuals.

LAST WORD

People are the other predator of Scorpionfish. In a few cases, they are fished commercially and many of them are sought for the home aquarium trade. However, in this case the Scorpionfish may have the last laugh as there are many cautions about avoiding the spines and warnings that the Scorpionfish have big appetites and are willing to eat anything smaller than themselves.

If you are unfortunate enough to have a Scorpionfish spine puncture your skin, follow these steps:

First Aid Treatment

1. Immerse the affected area in hot water up to 120 degrees (Destabilizes the poison).
2. Apply a broad pressure bandage (Restricts the flow of venom along lymph vessels).
3. Wash wound (Removes excess venom and debris).
4. Apply local anesthetic (Reduces pain and prevents infection).
5. If possible determine the species of Scorpionfish as different ones may have different recommended medications.
6. Seek medical help. Pain increases over time and may lead to paralysis of the limb. It is likely that some tissue will be lost around the wound.

What's in a Bar?

by Richard J. Johansson and James W. Rozzi

To some the answer may be a glass of cold beer or a salty margarita. To others, the answer to the question relates to the amount of pressure in their dive cylinder. The number of bar determines the volume of gas available for use in a specific cylinder.

Most divers outside of the United States use the Metric System, which is formally known as the International System of Units. In 1964, the same system was adopted for scientific use in the United States by the U.S. National Bureau of Standards.

The fundamental units of the Metric System are the kilogram and the meter. The metric system is based on the decimal system which means that all derived units of measurement are multiples of ten. For example in linear measurement, 10 millimeters(mm) equal 1 centimeter(cm), 10 cm equal 1 decimeter(dm) and 10dm equal 1 meter(m).

In the United States Customary System, the basic units of measurement are the yard and the pound. The same units are also the basis of the British Imperial System. There are no primary standards in either except those defined in terms of the standards of the Metric System. Metric standards were adopted in 1959 by agreement between the United States and Great Britain. Thereafter the yard and the pound where defined in terms of these metric standards for use in the United States and Great Britain.

The following sets forth Metric and U.S. Customary Equivalents which may be useful to the diver desiring to understand both systems.

Linear Measurement

U.S. to Metric
1 inch = 2.54 centimeters
1 foot = 0.3048 meter
1'yard = 0.9144 meter
1 land mile = 1.6093 kilometers
1 naut. mile = 1.852 kilometers

Metric to U.S.
1 centimeter = 0.3937 inches
1 meter = 3.281 feet
1 meter = 39.37 inches
1 kilometer = 0.6213 mile
1 kilometer = 0.5399 naut. mile

Examples:

1. It is 5 miles to the nearest dive-site. How many kilometers is it? It is 8.05 km to the dive-site. (5 x 1.6093 = 8.05 km)

2. The dive plan is to a maximum depth of 150 feet. How many meters is this? It is 45.72 meters. (150 x 0.3048 = 45.72 meters)

3. Your Swedish buddy's dive plan is to 30.48 meters. How deep is this in feet? It is 100 feet. (30.48 x 3.281 = 100 feet)

Cubic Measurement

U.S. to Metric
1 cubic foot = 0.0283 cubic meter
1 cubic foot = 28.3168 liters

Metric to U.S.
1 cubic meter = 35.3147 cubic feet
1 liter = 0.0353 cubic feet

Examples:

1. Your German buddy's Luxfer Al 80 filled to 3000 psig has 77.7 cubic feet of air. How much air does your German friend have? He has 2.19 cubic meters or 2192 liters.
(77.7 x .0283 = 2.19 cubic meters or
77.7 x 28.3168 = 2200.21 liters)

2. On your second dive your buddy says he has 1800 liters of air in his Al 80. How much is this in Cubic feet? It is 63.5 cubic feet.
(1800 x 0.0353 = 63.54 cubic feet)

Pressure

U.S. to Metric
1 psi = 0.0689 bar
1 atmosphere = 1.0132 bar
1 FSW = 0.0303 bar
1 FFW = 0.0294 bar

Metric to U.S.
1 bar = 14.5038 psi
1 bar = 0.9869 atmosphere
1 bar = 33 FSW
1 bar = 34 FFW

Examples:

1. Your Al 80 is filled to 3000 psig. Your Spanish friend asks you how many bar you have. You tell him 207. (3000 x 0.0689 = 206.7)

2. Your French dive buddy plans a saltwater dive to 4 bar absolute pressure. What is the depth of the dive in feet? It is 99 feet. (Subtract 1 bar atmospheric from 4 bar absolute. Then 3 x 33 =99)

Mass

U.S. to Metric
1 pound = 0.4535 kilograms

Metric to U.S.
1 kilogram = 2.2046 pounds

Example:

Your Italian dive buddy offers to fix you up with a blind date. He casually states that she weighs 50 kilograms. You want to know what she weighs in pounds. It is 110.2 pounds. (50 x 2.2046 = 110.23 pounds)

Temperature

U.S. to Metric
Fahrenheit to Celsius.....C = 5/9(F-32)

Metric to U.S.
Celsius to Fahrenheit.....F = (9/5C)+32

Example:

You have been invited on a live aboard dive trip. The ship's information packet states that the average water temperature for the season is 10 degrees Celsius. Will you pack your dry suit or wetsuit? Your dry suit, the water temperature is 50 degrees Fahrenheit.

Dive Planning

The Metric system makes dive planning simple. Meters convert easily to ATA by dividing the number of meters by ten and adding 1 to arrive at atmospheres absolute.

Liters and bar also convert easily. Bar is determined by dividing liters of free gas (LFG) by the internal volume of the cylinder in liters. For an Al 80 it is 2296.43 liters of gas divided by the 11.11-liter internal tank volume, which equals 206.7 bar.

Example:

A diver with an RMV of 17 liters per minute (.6 ft3 / min) plans a saltwater cave dive to 25 meters (82.02 feet.) for 30 minutes with twin Al 80 tanks filled to 207 bar (3000 psig). How many liters are needed for the dive?

1. 25 meters = 3.5 ATA.

2. 17 liters/min RMV x 3.5 ata = 59.5 liter/min (2.1 cu ft/ min) at 25 meters.

3. 59.5 liters/min x 30 minutes = 1785 liters needed for the dive without rule of thirds.

4. 1785 liters x 1.5 = 2677.5 liters needed with rule of thirds.

5. The diver has 4592.86 LFG in the Al 80's.

6. His bar turn pressure is 207/3 x 2 = 138.

METRIC CONVERSIONS		
1 in	=	2.54 cm
1 m	=	39.37 in
1 mi	=	1.609 km
1 n mi	=	1.852 km
1 cu ft	=	28.317 L
1 cu ft	=	.0238 cu m
1 psi	=	.0689 bar
1 bar	=	1 ata
1 bar	=	10 m SW
1 bar	=	14.5038 psi
1 kg	=	2.2046 lbs
°C	=	5/9(F-32)
°F	=	(9/5c)=32

Richard J. Johansson is fluent in Swedish and English. He resides in Sweden and is a technical dive instructor.

James W. Rozzi is an Advanced Diver Magazine staff writer and explorer.

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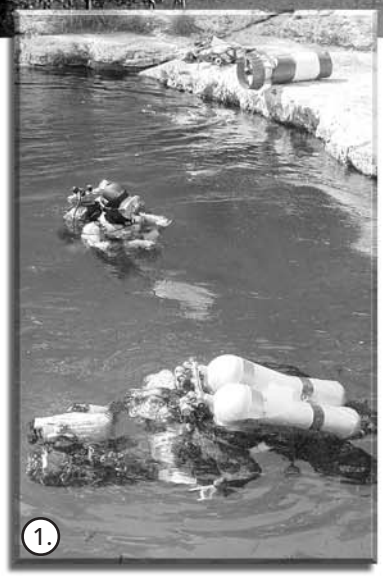
Templo de las siete Munecas
(Temple of the Seven Dolls)
Aligned with major astronomical points, it is the only Maya temple with windows and a tower instead of a roof comb.



1.

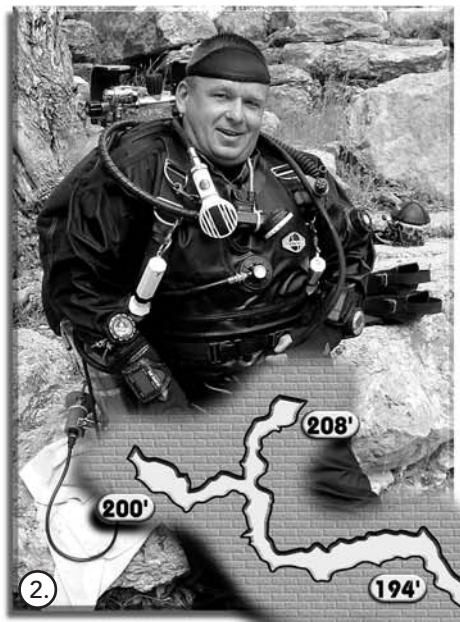
DZIBILCHALTUN
EXPLORATION XLACAH

By Michael Garman

The Dzibilchaltun archaeological site is located approximately 10 miles north of Merida on the Yucatan Peninsula of Mexico. Dzibilchaltun means "the place where there's writing on the stones." It is one of the longest occupied Mayan settlements, having been occupied as early as 1000 B.C. and remaining under Mayan control until the Spanish conquest in 1540 A.D. The six square mile archaeological site contains more than 8,400 structures and 12 stone roads. The settlement was built around the cenote Xlacah, which means old town.

Divers originally explored the cenote between 1957 and 1959 during a National Geographic expedition. During this excursion, thousands of artifacts were recovered from the cenote and the adjoining cavern. Many of these artifacts are currently displayed in the Dzibilchaltun museum. Since 1959, expeditions by the La Venta group, Texas A&M University, and the Woodville Karst Plain Project have explored thousands of feet of passages in the Xlacah cave system. However, the Instituto Nacional de Antropologle (INAH) that manages Mexico's archaeological sites had never been provided with a complete map of the known cave system.

INAH agreed to allow access to Xlacah for the purpose of creating a map of the cave system. Alex Warren, Sherry Garman, Jitka Hyniova, Jakub Rehacek, and myself were to perform the survey in November to coincide with the annual Cave Diving Encounter in Merida, sponsored by the Secretary of Ecology. Alex and Jitka drove 10 sets of steel doubles, 22 single tanks, seven scooters and an assortment of video lights from Tampa, Florida, to Merida.



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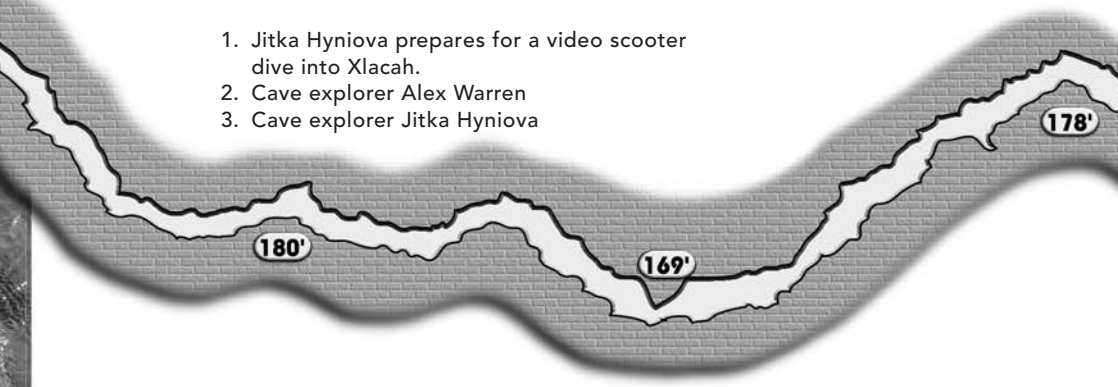


1. Jitka Hyniova prepares for a video scooter dive into Xlacah.
2. Cave explorer Alex Warren
3. Cave explorer Jitka Hyniova

4. Sherry Garman preparing for the push dive into Xlacah.
5. Cave explorer Jakub Rehacek
6. Cave explorer and biologist Michael Garman

In Merida, we stayed with our friend Carlos Varguez, who works for the Secretary of Ecology. On November 12, we arrived at Xlacah to perform a reconnaissance dive and scootered 2,100 feet into the cave. The front part of the cave system is big and beautiful. The main passage is 50 to 80 feet wide and 20 feet tall with white scalloped walls and beautiful blue water, which allows primary lights to be seen over 100 feet away. We found the line to be in good condition except for the first 700 feet, where two and three lines were present and there was slack from broken ties. We were surprised to find saltwater in two locations where the cave floor dropped below 184 feet. The saltwater contained sulfide and the freshwater above contained white clouds of sulfur particles that form when the sulfide from the saltwater reacts with oxygen in the freshwater.


4.

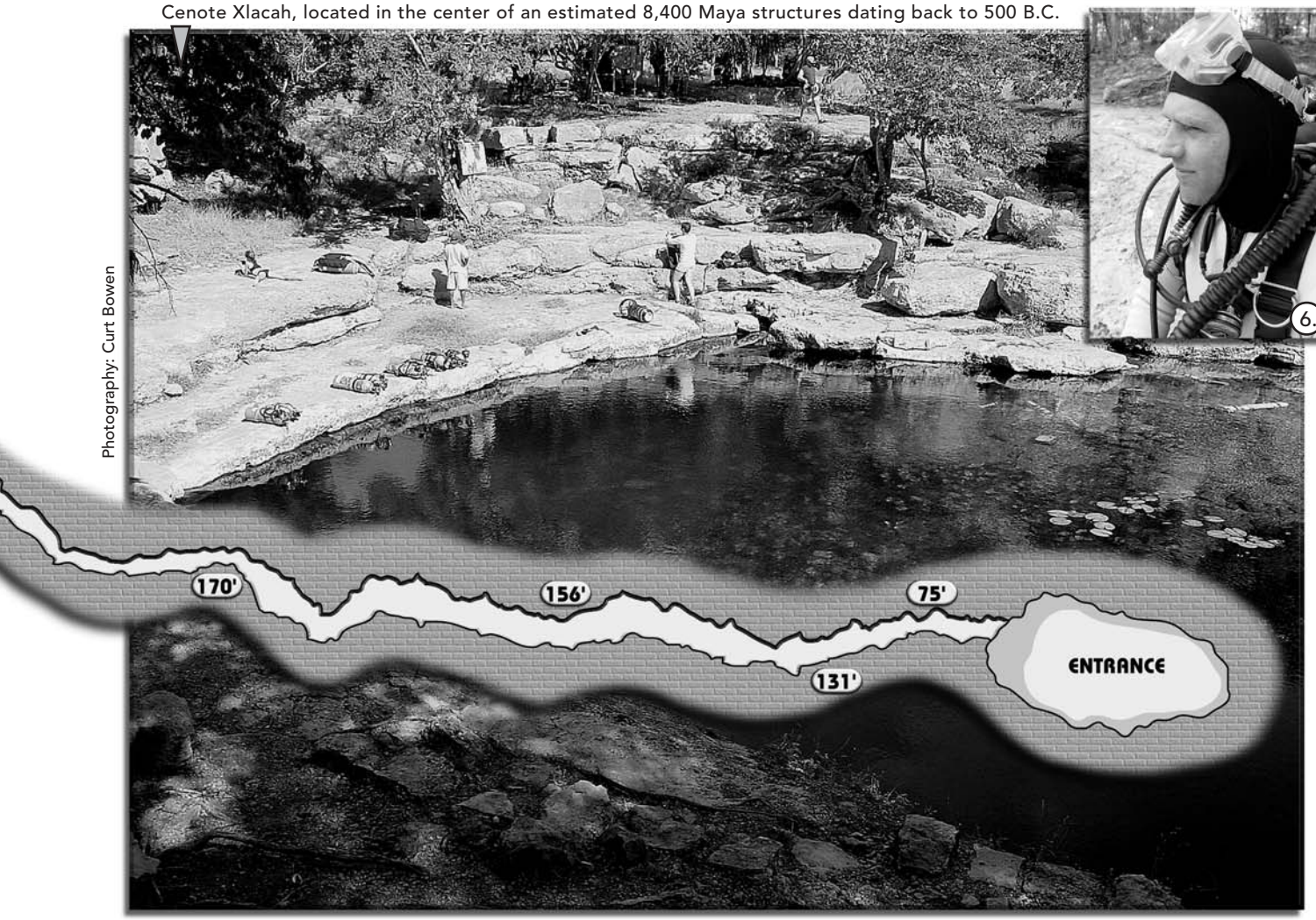
The survey began on November 13. Alex and Sherry were set to replace the line in the first 1,000 feet of penetration. Alex was to survey the new line on the way out while Sherry removed the old line. At the same time, I began surveying from a penetration of 1,000 feet into the cave while Jitka and Jakub took passage width and height measurements. Alex and Sherry accomplished their task while Jakub, Jitka, and I surveyed about 600 feet of line through the first saltwater layer.


5.

On November 14, everyone was carrying two stages. Alex and Sherry went to the far side of the second saltwater layer, 2,100 feet penetration, and survey into the cave, while Jitka, Jakub, and I surveyed from 1,600 feet penetration to 2,100 feet. Alex and Sherry surveyed to 3,000 feet penetration while Jitka and I made it to their starting point. Jakub turned his dive early because of a primary light failure. Following this dive everyone was exhausted. We had completed three straight days of 180-foot deep dives and a 400-foot deep dive in the cenote Sabak-Ha before diving at Xlacah. Even though we each had two sets of doubles, one to fill while diving another, all of our stage and deco bottles were empty. We decided to fill tanks the next morning and do some sightseeing in the afternoon.


6.

Cenote Xlacah, located in the center of an estimated 8,400 Maya structures dating back to 500 B.C.



Photography: Curt Bowen

The final survey dive was on November 16. For this dive, Alex carried three stages and towed a spare scooter, while I carried two stages. Jitka, Jakub, and Sherry began their dive 10 minutes ahead of Alex and me. They brought four extra stage bottles to 2,100 feet for Alex and me to use on our way out. The plan was for Alex to go to the end of the line and survey toward the entrance while I surveyed from where Alex and Sherry left off on the previous dive toward the end.

Alex and I met the first team beyond the second saltwater layer, where we each dropped an empty stage and verified that there were full stages waiting for our return. At 3,000 feet, I dropped my scooter and began surveying. Almost immediately the wide passage became a tunnel five feet high and two to three feet wide that dropped into a third saltwater layer. The visibility was only two feet, because Alex had already come through the tunnel and stirred up the halocline with his scooter, knocking limestone dust from the rock with his exhaust.

In the low visibility, I dropped my survey board. I felt for it but could not find it. I floated against the ceiling and watched the silt flow by. The tunnel was a siphon and was clearing quickly. However, time pressure was mounting. I was 32 minutes into the dive and our turnaround time was 60 minutes. Otherwise, we would be cutting our decompression gas supply too close. After a few agonizing minutes, the silt cleared and I saw my slate between two boulders. I picked it up and continued surveying. The saltwater layer ended at a large room. In the middle of the room, I met Alex coming toward me. He checked a lead to the side while I looked at the end of the line.

The line ended at a small bedding plane restriction. I turned and swam back to the lead Alex was following and took a compass heading. I could see Alex's light coming toward me and checked my bottom timer. It read 60 minutes — time to turn the dive. As I swam back through the narrow saltwater tunnel, I kept expecting Alex to catch me on his scooter, but he did not. Unknown to me, Alex had caught a small rock between his scooter blade and shroud. It took Alex a minute to realize why the scooter had quit before he removed the rock.

Knowing that Alex had an extra stage, I picked up my scooter and continued to the stage drop. I picked up my extra stages and turned to face into the cave. I could see Alex's light. As soon as Alex was close enough to signal and gave me an "okay" with his light, I headed toward the entrance. Alex was close behind the entire way out as his Predator scooter was faster than mine.

We reached our first decompression stop at 110 feet at 95 minutes. We switched to EANx 50 percent at 70 feet and oxygen at 20 feet. Curt Bowen — who was in Merida for the Cave Diving Encounter — met us at our 100-foot stop and took our spent stages and scooters to the surface, which saved us the effort. At my 40-foot stop, I was running out of EANx 50 percent so I signaled to Jakub, who brought me an extra bottle. We surfaced after four-and-a-half hours of dive time exhausted, but satisfied that we had completed the project and would be able to provide INAH with a map of the cave system.

This project was supported by the National Association for Cave Diving, American Underwater Lighting, Liquid Fit Wetsuits, Sartek Industries and Seasoft-Watermark Scuba.

http://caveworld.com http://www.seeteam.com

Giant Pacific Octopus

By John Rawlings

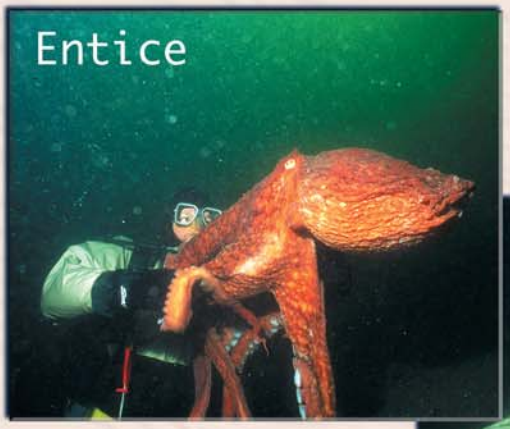
Tall Tales Are Told.....

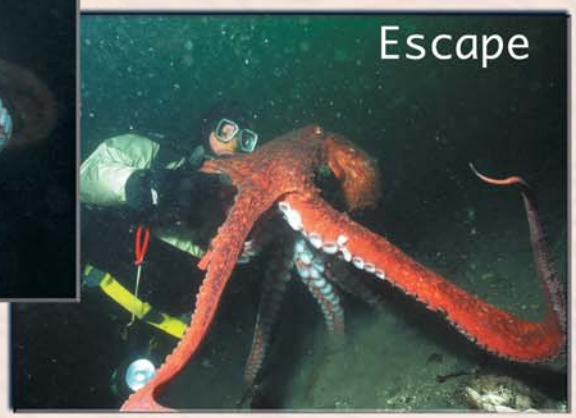
"There I was. He was lookin' at me.....I was lookin' at him....."and so, it began again. My long time friend and dive buddy, "Sparky", began yet another tale of daring-do, regaling our captive fellow divers with a story of his underwater adventures stalking the enormous beasts of Puget Sound. As I continued to gear up, I occasionally glanced in his direction, scanning the eyes of his audience as the story grew with the telling. Bemused, I noted that some were wide with awe, some held an obvious gleam of interest, while still others were clearly full of disbelief (having obviously labeled him as a BS artist). Inevitably, his stories always involve creatures of great size, designed to impress his audience. Having dived Puget Sound with Sparky for a number of years I know that, just as inevitably, his stories are true. On this particular day we were aboard a charter boat, the "Misty Fjord", in search of one of the most famous of Puget Sound critters, the Giant Pacific Octopus. Our destination was "Sunrise Wall", a beautiful site in the South Sound noted for Octopuses of great size. Throughout all my years of diving in our cold, emerald waters, I have never failed to be thrilled at the thought of interacting with one of these marvelous giants. As we cruised along I could feel the Misty's diesels rumbling under the deck beneath me, and I could feel my excitement growing as well.

You saw one HOW big.....?

The Giant Pacific Octopus is a cephalopod mollusc, a class that contains all other octopus, squid and cuttlefish. It is regarded as the largest species of octopus in the world. Until recently it was known as *Octopus dofleini*, but in 1998 it was re-classified as *Enteroctopus dofleini*, part of a genus that includes all other giant

Eye to eye in the emerald waters of Puget Sound, two intelligent creatures interact with each other and compare notes.





octopus species. Rumors abound in the Pacific Northwest regarding the size to which E. dofleini is capable of growing, including one supposedly found dead years ago in the Ballard Locks in Seattle that is said to have exceeded 30 feet in local mythology. Tall tales aside, the most impressive "official" record that I have been able to locate is one from the Canadian Department of Fisheries and Oceans web site, indicating that the largest Giant Pacific Octopus on record weighed 272 kg (599.6 pounds!), with a total arm spread of 9.6 meters (31.5 feet!). Others have reportedly been found within the 300 to 400 pound range. These records, however, are disputed by many biologists, and in reality finding one that exceeds 100 pounds is extremely unusual. Generally, it is agreed that *E. dofleini* can reach a size of over 150 pounds, although a typical adult will be in the 60 to 80 pound range. Still, the size of the Giant Pacific Octopus is apparently limited only by the quality and quantity of its food……literally, if it eats well, it'll GROW!

Good looking, smart, and a lot of heart(s)!

Like all octopuses, *E. dofleini* has eight arms attached to the head/mantle area centered around a mouth. They have no bones -- the only hard part of their body being a beak used to bite and kill prey. Each arm has rows of suckers along the full length to the tip. The arms are incredibly sensitive and have many nerves within them as well as in the suckers themselves. Octopuses can actually taste with their suckers and use them as one of their primary means of gathering information along with their excellent eyesight. *E. dofleini* has two rows of suckers per arm and can have as many as 1,600 of them. The mantle itself resembles a large bag that moves in and out as the octopus breathes. It contains the stomach and all of the other organs, including three hearts. Two of the hearts pump blood through the gills while the third pumps it through the body itself. When octopuses breathe in, water flows over the gills and fills the mantle, when they breathe out the water is forced from the mantle through a tube called a siphon. *E. dofleini* can force water through this siphon in such a manner that it can jet propel itself away from predators (or a too-curious diver) and have been known to travel large distances in this manner. Octopuses are known to be the most intelligent of the invertebrates and documentation exists that clearly shows evidence of curiosity, memory, planning, and even personality. Their skills include problem solving, stealth and mimicry and they have been known to open jars, make use of tools, and even to play.

The Giants are also masters of camouflage, having specialized cells in their skin known as chromatophores that are under direct neural control. This allows them to change color in a matter of seconds based on their surroundings or situation, and also enables them to make patterns on their skin based on a series of rapid

color changes. Further, they can raise or lower papillae on their skin, literally changing their texture in an instant. Combined, these abilities allow *E. dofleini* to rapidly change color, shape, position and texture from one moment to the next. When a diver witnesses such a spectacle it is one of the most beautiful sights in nature, but realistically speaking these capabilities are what make the Giant Pacific Octopus one of the most effective predators in the sea.

A preference for "fast" food.....

When it comes to food, E. dofleini and humans seem to share many of the same seafood preferences. In fact, when recently dining at a locally famous seafood restaurant near Seattle, I was struck by how much the menu resembled a list of octopus favorites! In Puget Sound, the delectable Dungeness crab heads the list of preferred food items, but all types of shrimp, clams, crustaceans, fish and other molluscs are also on the menu. Octopuses are among the most mobile of the oceans' predators and will travel extensively in search of their food. However, they will normally return to their den after their hunting expeditions, bringing their prey with them for "in-house dining". One of the most certain signs of current or recent den occupancy is a large accumulation of crab shells and other shellfish debris near the mouth of the den. A den located in an area of particular food abundance can often have a lot of discarded and broken shells several feet high. Normally hunting at night, E. dofleini requires a heavy abundance of speed, stealth and skill to catch its favorite meal -- Dungeness Crab, which are master sprinters and capable of awe-inspiring bursts of speed when fleeing a hungry octopus (or diver!). Typically, the hunting tactics of *E. dofleini* involve a slow approach by stealth with each of the independent arms surrounding the unsuspecting victim, coupled with a sudden burst of speed in which the prey is enshrouded by the arm web and held in place with the suckers. The octopus' beak is then used to kill the prey and tear it into pieces for feeding.

A female Giant Pacific Octopus tending her eggs in a rocky den.
Photo by: Laurel LaFever

No larger than a Coke Bottle, this tiny Red Octopus can also be found in Puget Sound.

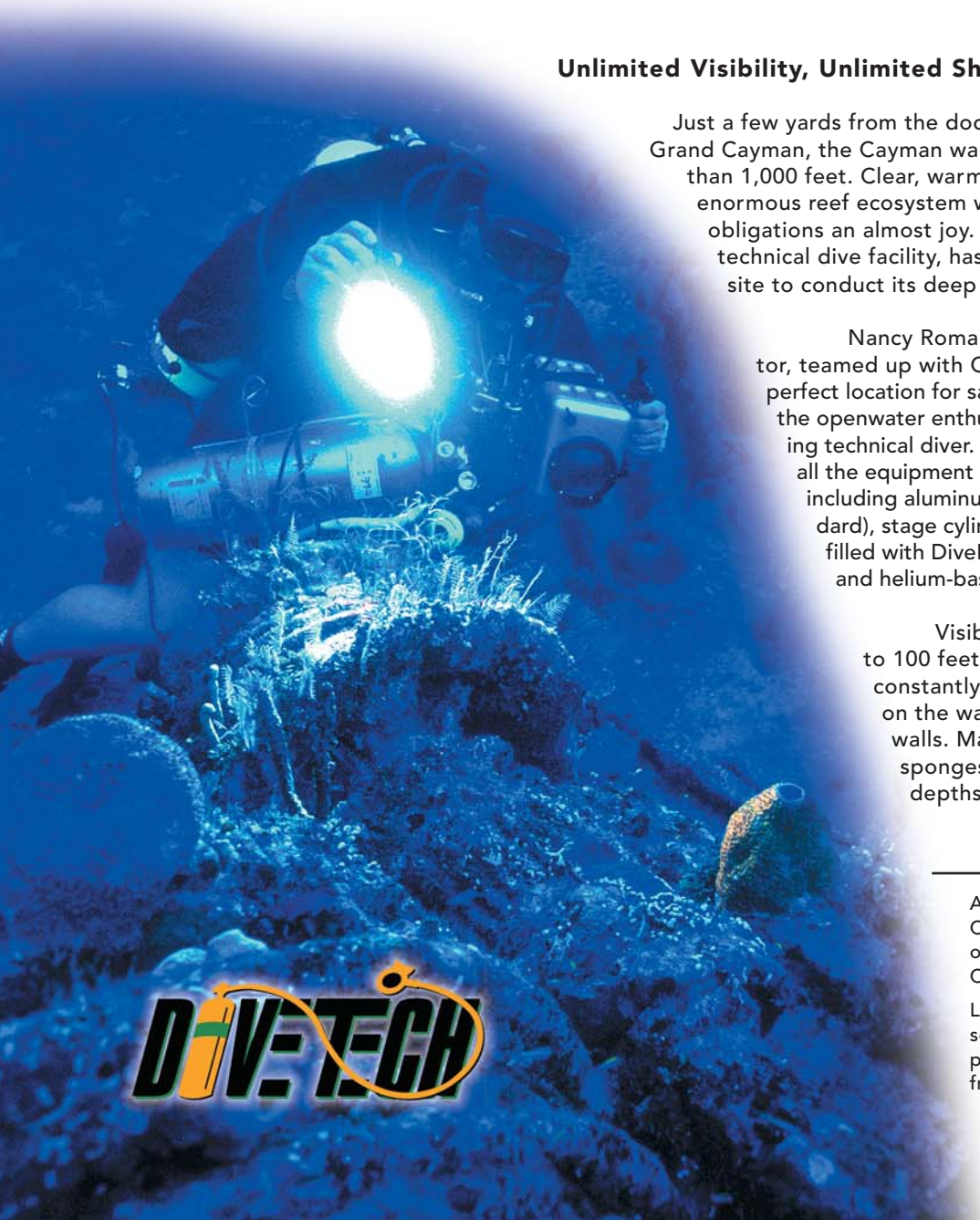
Prime Real Estate for Giants.....

Dwelling on the continental shelf of Western North America as well as Northern Japan and the Russian far-east, the range of *E. dofleini* extends in the United States from Southern California up the Pacific coast to the tip of the Aleutian Islands in Alaska. *E. dofleini* can literally be found everywhere within Puget Sound but have a decided preference for areas containing abundant food sources as well as the best denning opportunities. Dens are vital to these giants at virtually all stages of their development, so sites with abundant natural or artificial dens are extremely attractive to them. Most dens are found in naturally occurring holes, cracks or crevices within rocks or walls, although often E. dofleini will dig a suitable den in sand or under a log or rock if a ready-made den isn't immediately available. Man-made objects are also popular as dens and octopuses can often be located within the nooks and crannies of wrecks, abandoned sewer pipes, and any other type of suitable debris. Small octopuses can also be found denning within bottles, jars or pipes on the bottom. Dens are usually only temporarily occupied, an octopus generally remaining in an area only so long as the food supply lasts. It will move on to greener pastures once hunting becomes difficult or foraging expeditions more far ranging. *E. dofleini* does not appear to be territorial, although smaller octopuses will generally retreat from a larger individual should one be encountered. The Giant Pacific Octopus is an asocial animal -- they do not deliberately avoid each other, but they also do not seek each other's company except when breeding is on the agenda. In areas where dens are scarce, competition for them may be intense and divers may find several octopuses near each other simply because of the close proximity of good den opportunities.

Continued on page 57

DEEP IN GRAND CAYMAN

Text by Leroy McNeal
Photography by: Curt Bowen



Unlimited Visibility, Unlimited Shore Dives, Unlimited Depth

Just a few yards from the dock at Cobalt Coast Dive Resort, Grand Cayman, the Cayman wall drops almost vertically to more than 1,000 feet. Clear, warm, tropical waters support an enormous reef ecosystem which makes decompression obligations an almost joy. Divetech, the Cayman's first technical dive facility, has taken full advantage of this unique site to conduct its deep mixed gas training.

Nancy Romanica, founder and technical instructor, teamed up with Cobalt Coast Resort to offer a perfect location for safe, controlled training not only for the openwater enthusiast but also for the more demanding technical diver. A full technical facility, Divetech has all the equipment available for the technical explorer, including aluminum and steel doubles (din or standard), stage cylinders, lights, reels, a complete shop filled with DiveRite/Scubapro supplies and nitrox and helium-based mixes.

Visibility never decreases less than 80 to 100 feet on the shallow reef system and is constantly well over 150 to 400 feet deeper on the wall. Marine life varies on the reef and walls. Many species of fish, corals and sponges have adapted to preferred depths, thus new sights can be seen no

Above: 180 degree panoramic photo of Cobalt Coast / DiveTech Resort located on the north western side of Grand Cayman. Photo C. Bowen

Left: Diver, Leroy McNeal videos the bow section of the Carrie Lee wreck which is poised precariously on the Cayman Wall from 170 to 240 ft.

Photo: Natural sunlight shot with Provia 400 pushed to 800
Aquatica Housing / Nikon N90 C. Bowen
Right: Cayman Wall Illustration and Submarine Photo C. Bowen

matter how deep one dives. New or very rare species are actually still being discovered living below 200 feet.

Swimming off the dock's end at Cobalt Coast, divers will first experience the tidal wave zone where not many fish or hard corals can survive because of the intense wave action. In a few minutes this zone gives way to the natural, shallow (30 to 70 feet) reef zone where typical, bright-colored tropical reef fishes, corals, rays and eels thrive. The wall slopes slowly at first with giant coral fingers and never-ending sand chutes. Below 100 feet and along the deep blue ocean lives the larger predator fish, manta rays and an occasional whale shark -- if one is fortunate enough to catch a glimpse of this amazing creature!

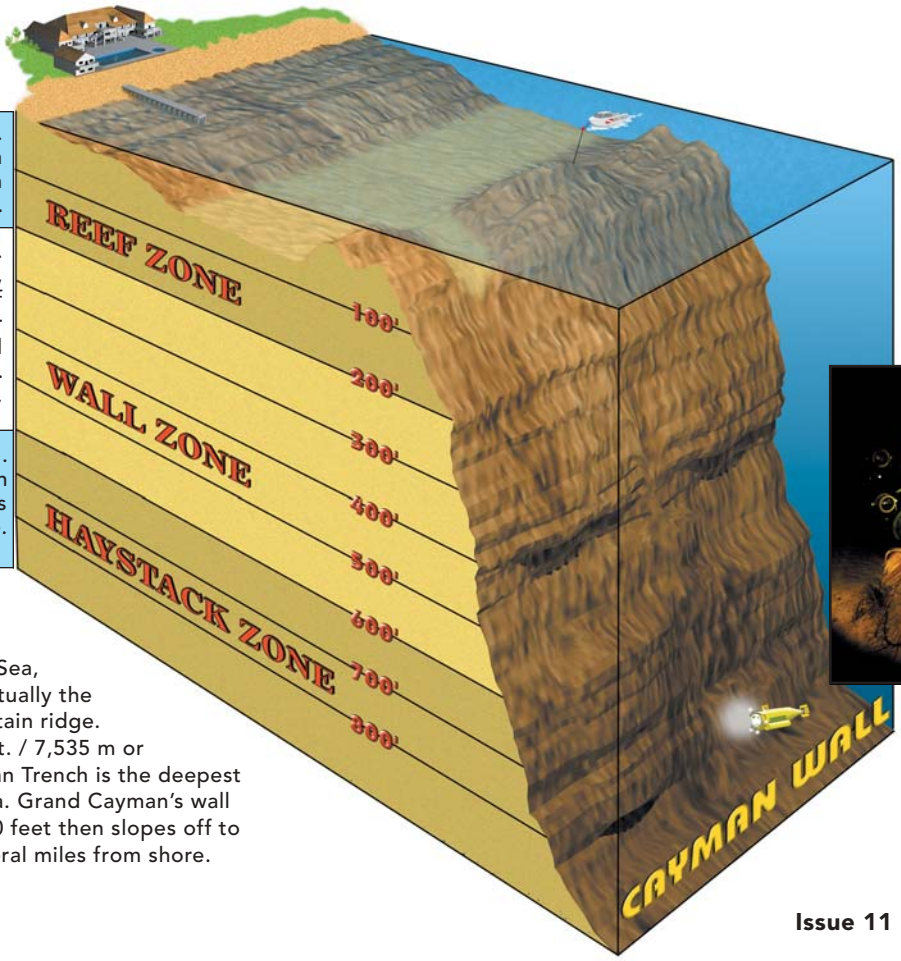
Between 200 and 350 feet is the giant sponge belt. Growing to the size of a small truck, these giants become an actual small ecosystem within themselves, sustaining a variety of small fishes, crustaceans and predators. The crystal clear water allows ample light; and in fact, when exploring the sponge belt at 300 feet, one can easily look down the wall to a depth of well over 500 feet.

Atlantis Submarine, located in George Town, offers the once-in-a-lifetime chance to see the unique forms of deepwater life existing on the Cayman wall down to depths reaching 1,000 feet. Equipped with two passengers and a captain, the comfortable-sized submarine

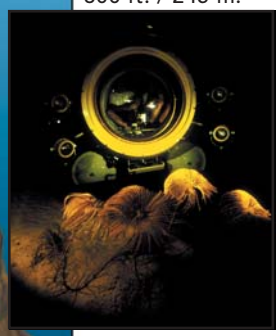
0 to 200 ft. Abundant light supports a thriving coral reef system with thousands of species of life.

200 to 600 ft. Classified as the "sponge belt", reduced light and steep cliff walls provides a habitat for sponges, crustaceans and primitive life forms. Few fish live in this zone.

600 to 1000+ ft. Strange deep water fish and unique life forms dwell in this zone.



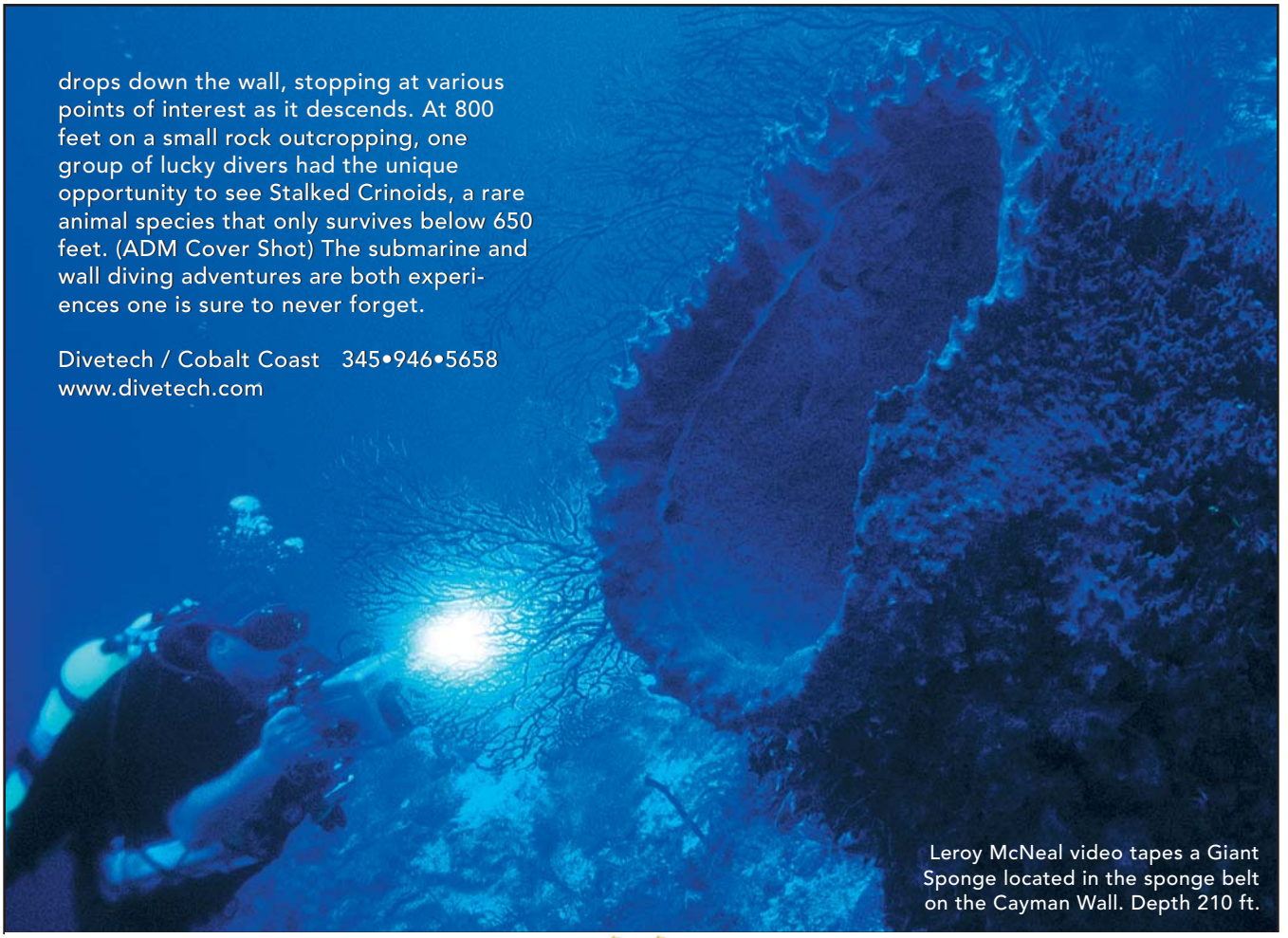
Below: Atlantis Submarine explores depths to 1000 feet. Viewing rare Stalked Crinoids attached to the wall at 800 ft. / 245 m.



Located in the Caribbean Sea, the Cayman Islands are actually the tops of the Cayman mountain ridge. Dropping to over 24,700 ft. / 7,535 m or 4.6 miles deep, the Cayman Trench is the deepest point in the Caribbean Sea. Grand Cayman's wall quickly drops to over 1000 feet then slopes off to over 5000 feet within several miles from shore.

drops down the wall, stopping at various points of interest as it descends. At 800 feet on a small rock outcropping, one group of lucky divers had the unique opportunity to see Stalked Crinoids, a rare animal species that only survives below 650 feet. (ADM Cover Shot) The submarine and wall diving adventures are both experiences one is sure to never forget.

Divetech / Cobalt Coast 345•946•5658
www.divetech.com



Leroy McNeal video tapes a Giant Sponge located in the sponge belt on the Cayman Wall. Depth 210 ft.

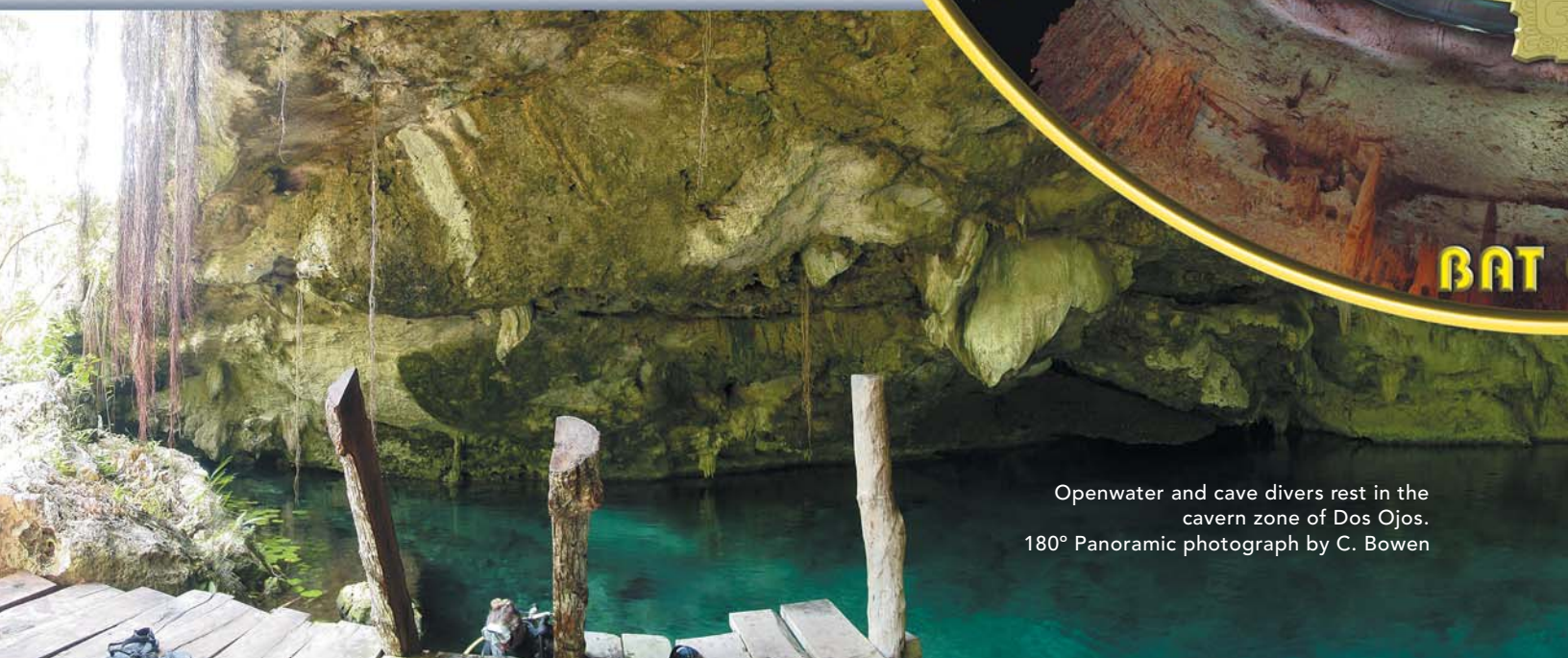
Photo: Natural sunlight shot with Provia 400 pushed to 800
Aquatica Housing / Nikon N90 C. Bowen

HIDDEN WORLDS
CENOTES

It's a jungle out there!
By Brian Renton

The state of Quintana Roo, in the Yucatan Peninsula, is about as far South as one can go in Mexico without leaving the country altogether. Here, deep in the heart of the Mexican Caribbean, a relatively little-known treat awaits the jaded diver -- the caverns and cenotes of the world's longest and most beautiful underground rivers.

I have come here at the fervent recommendation of a dreamy-eyed dive buddy to see for myself what the hullabaloo is all about. My destination today is Dos Ojos Dive Center at Hidden Worlds Cenotes park. So far, as I turn into the driveway between cedars, jacaranda and coconut palms, the name seems highly appropriate -- there is not a sign of a giant river or cavern anywhere. Instead, a line of weird-looking vehicles looms out of the surrounding jungle foliage in a wide range of odd sizes and shapes. Their big stripped-down engines and tropical camouflage seem straight out of a Mad Max set. A sign in front of me promises Dive Shop Information, so I follow the line arrow into the thatch-roofed building while narrowly avoid tripping over a spider monkey which trots briskly out the door -- its long hands waving animatedly above its head, apparently headed for the nearest palm tree. It is closely followed by a tall, bearded, barefoot gent in faded cutoff denim shorts with another monkey clinging to his head and a piece of sweet bread in one hand.



Openwater and cave divers rest in the cavern zone of Dos Ojos.
180° Panoramic photograph by C. Bowen

Soothingly assuring the little monkey that no one is planning to eat him in the immediate future, he rounds up the truant simian and returns to greet me with a double armful of jungle fauna. This, it turns out, is my host -- G. T. Buddy Quattlebaum, cave diver, explorer, and founder of Hidden Worlds Cenotes.

While apologizing to me for the miscreant monks, Buddy gets me geared up, and before I know it we are rumbling into the jungle behind the shop, in a jaguar-spotted junglemobile called Animal. Our first stop is Hilario's Well. Just five minutes from the shop, Buddy pulls over to the side of the road, and we walk over to peer into the vertical shaft, perhaps 10 feet in diameter, leading down into another world beneath the jungle floor. Buddy explains to me that this is the well that supplies water to the shop, but it turns out that the shaft also opens up into a beautiful cavern and cave that is profusely decorated with the most delicate, multicolored stalactites and stalagmites. It is literally a different world, he says.

We take a few minutes to snorkel into this cenote. Buddy explains that Hilario's Well offers an excellent snorkel tour, as well as cavern and cave dives, and I cannot help but be struck by the disparity between appearance and reality. What looks from the outside like the entrance into a narrow, dark cave is actually the doorway into a subterranean wonderland.

By now my appetite is wet. If the snorkeling is spectacular, what will it be like to dive here? Buddy hustles us along, reminding me that the sheer size of Hidden Worlds requires us to maintain a brisk pace if I am to get an adequate overview of what he describes as the biggest cave and cavern diving park in the world. More than 200,000 feet of an underground river system exists in the park. Continued on page 56

Circle Photo: Hidden Worlds Bat Cave. 360 Degree panoramic photograph taken by shooting 54, 8 second timed exposure shots while divers painted sections of the cave walls with Sartek HID video lights. All 54 photos stitched together to make a 360° degree shot in Adobe Photoshop. Photo: C. Bowen

Center Photo: Steve Gerrard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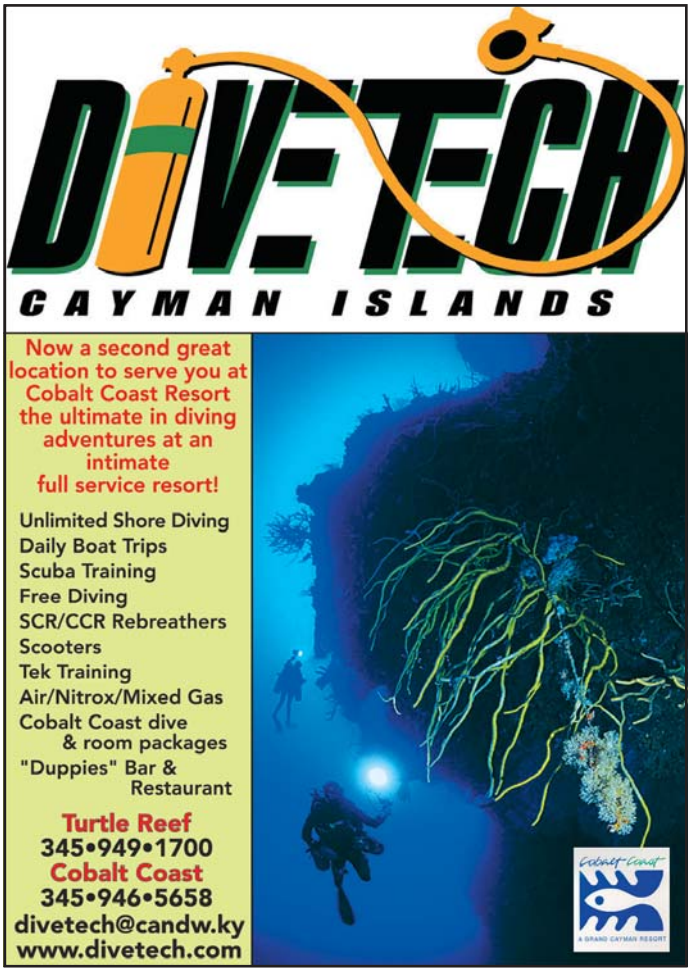
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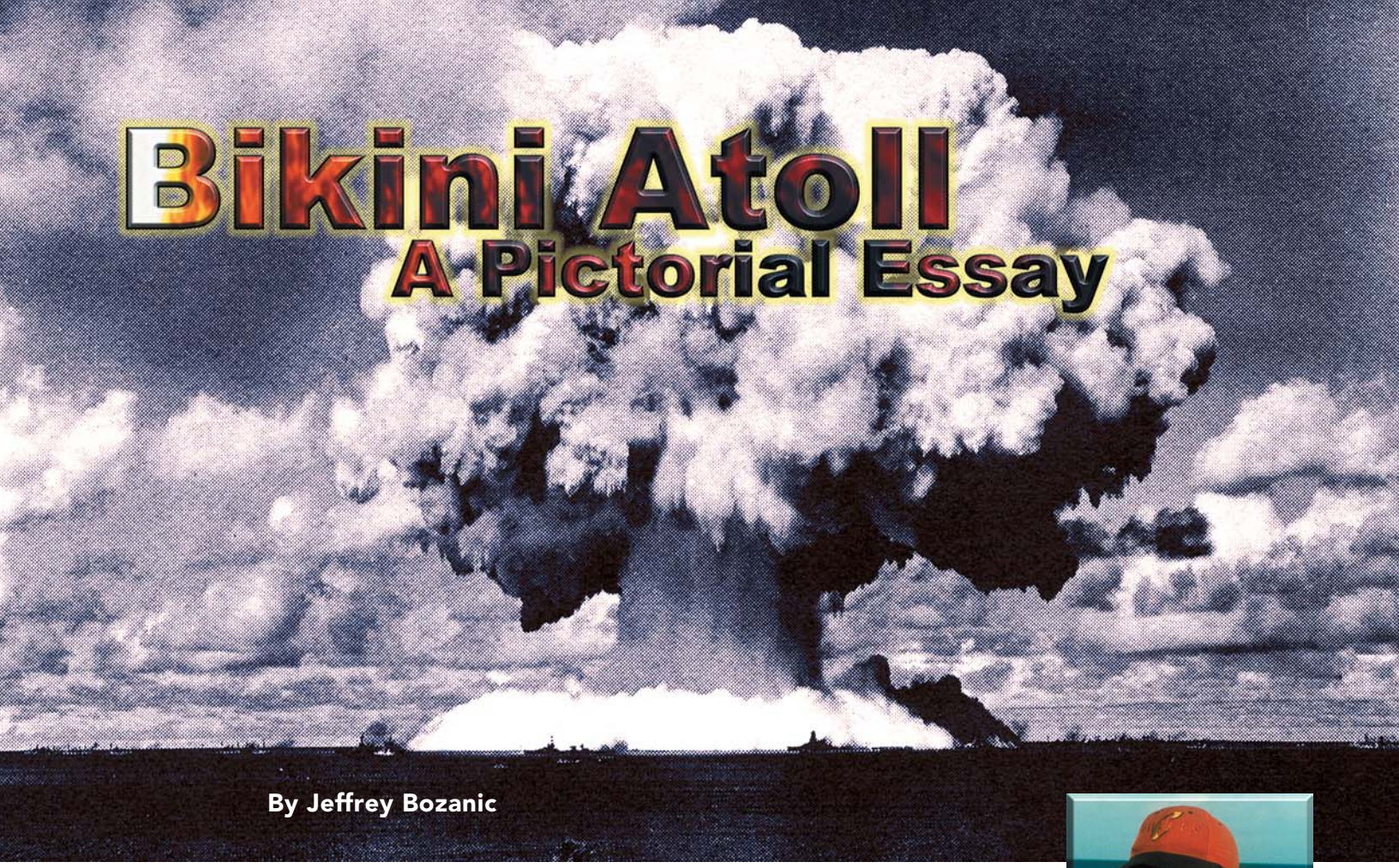
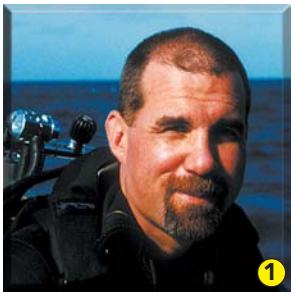
Bikini Atoll
A Pictorial Essay



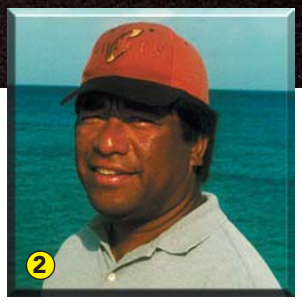
By Jeffrey Bozanic

In July 1946, a new era began. On the 1st and 25th days of that month, as part of Operation Crossroads, two atomic blasts sank 18 naval vessels in the lagoon of Bikini Atoll. Six other ships were so damaged by the blasts they were intentionally sunk shortly afterwards. These ships included, among others, an aircraft carrier, two battleships, a cruiser, two destroyers, four submarines, and two attack transports. Many of these have been found, providing some of the finest wreck diving on the planet. (Above: Photo of the underwater 23-kiloton Baker shot on July 25, 1946.)



In February 2001, another new era began. The Bikini Council conducted their first tour as the direct managers of the scuba operations on Bikini Atoll. Prior to that, Robert Reimers Enterprises had run the dive concession. Fabio Amaral, who started the dive operations on Bikini, left in November 2001, after seven years in the Marshall Islands. Tim Williams (1) arrived in February 2001, and is now the lead dive master on the island.

Evacuated by the U.S. Navy in 1946, the Bikinian people have been unable to return to live on their island after atomic testing ceased in 1954. Coconuts and other food supplies have been found to be too radioactive for long-term consumption. Edward Maddison (2) is the only dive master who is a native Bikini islander.



Getting to Bikini is an adventure in itself. Air Marshall Islands (3) operates a weekly flight to the Atoll, landing at the U.S. military base on Kwajalein to refuel. The Dornier 228 aircraft have limited payload, so baggage is limited to 30 pounds per person.

Bikini Atoll is part of the Republic of the Marshall Islands, which are comprised of 29 atolls and 5 islands. (4) The Bikini Council, a group elected every four years, governs Bikini.

The cafeteria and kitchen are known as "Ground Zero." Food is plentiful, and is served cafeteria style. Everything except the fish is brought in from off-island. The eight guest rooms each sleep one or two people, and are located a few yards from the water.

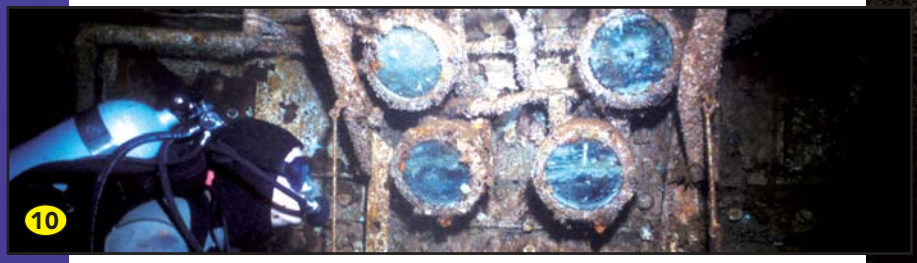
At Bikini Atoll (5) you land on a grass airstrip at Eneu Island, and then take a 20-minute boat ride to Bikini Island.

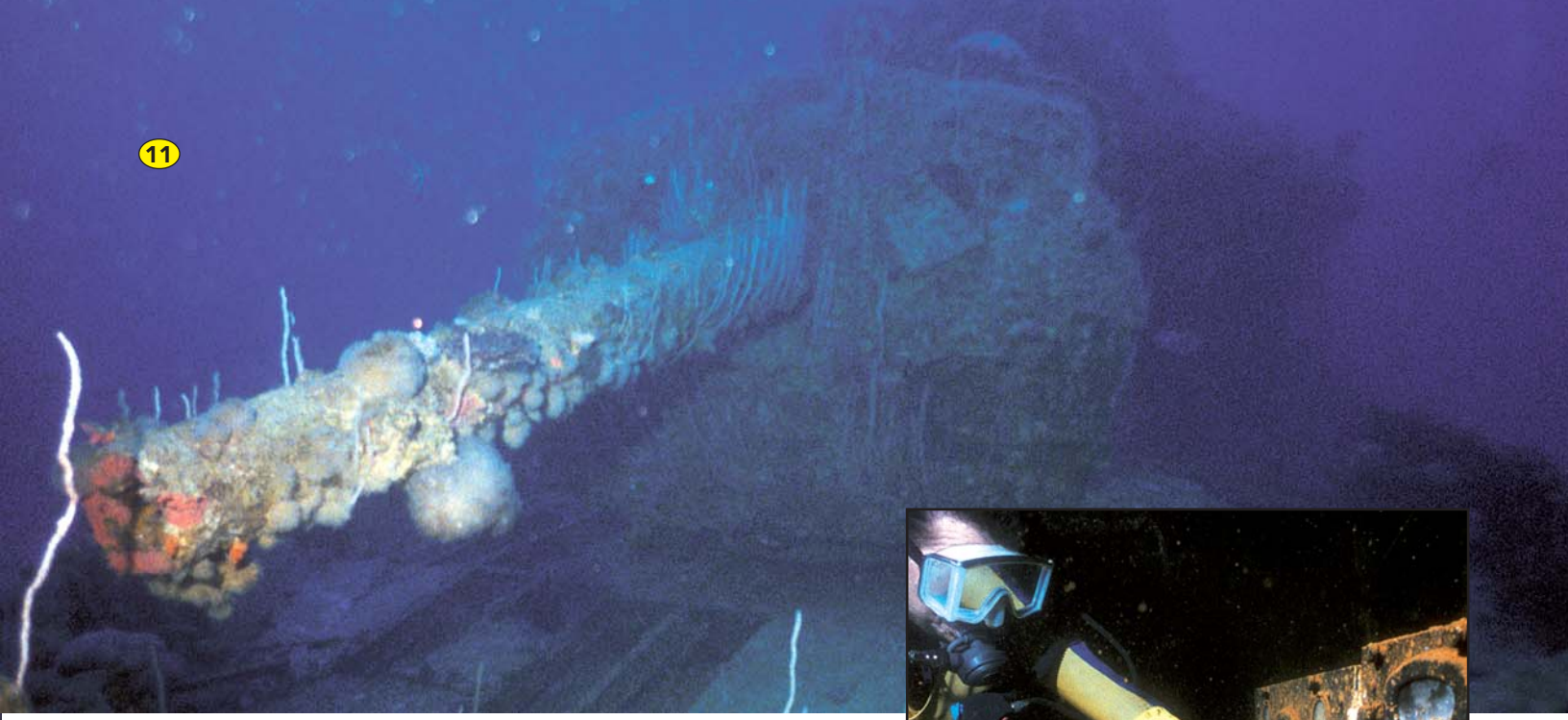
The Hammerhead (6) is outfitted to carry 13 divers, including guides. A new dive boat, the 42-foot (13m) Able Baker, has been recently moved to Bikini, providing more comfortable service.

Divers have the option to use twin 80 cf (7) or single 104 cf cylinders. Several divers have brought mixed gas closed-circuit rebreathers, which are supported by the 93% oxygen generated on the island. Divers generally do two dives a day, for a total of 12 in the week they are on Bikini. Dives are limited to two hours run time in the 84°F (29°C) water.

With depths averaging 120-140 fsw (36-42 msw), all of the diving involves staged decompression. While technical training in decompression techniques is strongly recommended, any experienced diver with at least 50 dives is generally allowed to dive the wrecks. To aid in decompression, deco bars are hung below the boat at 30, 20, and 10 fsw (9, 6, and 3 msw) for stops. EAN75 (nitrox with 75% oxygen) is hung from the boat and is available at the last two stops to reduce decompression times. Sharks and other pelagic fish are commonly observed while at decompression.

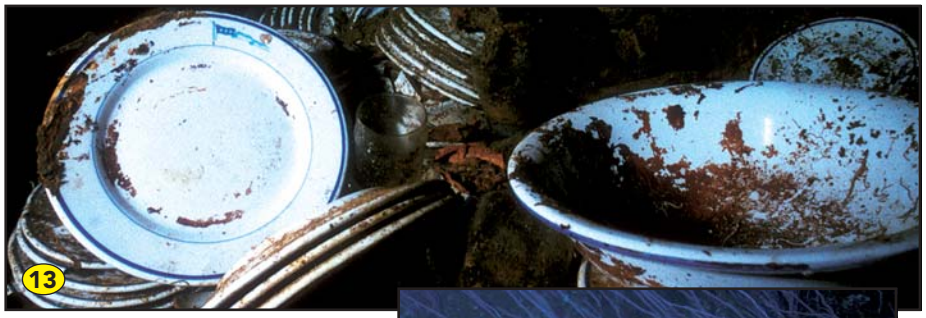
Your first dive is done the afternoon you arrive on island. It will be your most memorable checkout dive ever, as it is done on the USS Saratoga (CV-3), America's first operational aircraft carrier. The deck is about 90 fsw (27 msw) deep, and typically the group visits the three planes (9) still remaining in the aircraft hanger, as well as the bridge. The bridge is surprisingly well preserved, with easily recognizable equipment, nameplates still legible on the alarms controls (10), and a General Quarters alarm switch that still rotates.





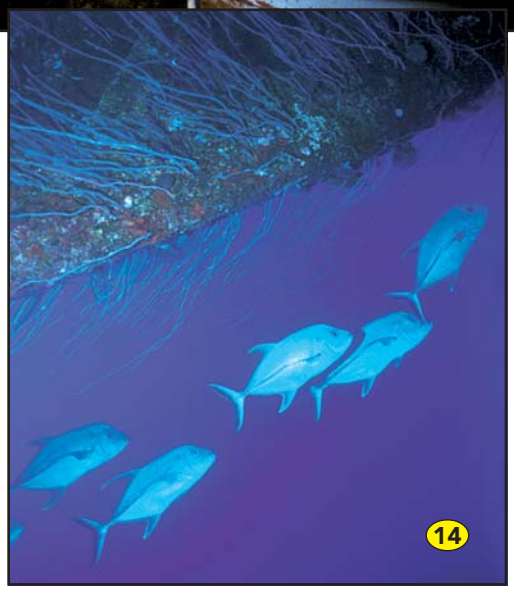
At 880 feet (268m) long, it is impossible to explore the Saratoga on a single dive. Dives typically make 4-7 dives on the Saratoga during their weeklong visit, with separate dive "tours" including the bow, anchor chain and bottom (at 180 fsw/55msw), Aviation Officers' Quarters, the Command Information Center (CIC), Blacksmith's Shop, Deck Guns (11) and the "Haunted House" (area below the flight deck collapsed by the atomic blast).

While much material had been removed from the vessels prior to the testing, many artifacts remain to be seen both on and within the sunken ships. Even after a two atomic bomb blasts, and more than 50 years underwater in tropic seas, the state of preservation of many items is remarkable. Brass on speaking tubes still gleam brightly, as though newly polished by some hapless seaman, radio gauges and dials are legible (12), light bulbs are intact, and the china in the china cabinet looks ready to use, with only a little "dusting." (13)



Surface intervals are about four hours. During this time, you eat lunch, and may choose to walk the miles of deserted beaches looking for glass fishing floats, swim or snorkel, read, watch one of the hundreds of films in the videotape library,... or just take a nap! This time also gives you an opportunity to looks for signs of the atomic bomb testing, like visiting the Bikinian graveyard, where tombstones are all partially knocked over from the bomb blasts many miles away.

The USS Apogon (SS-308) is a 312-foot (95m) long submarine that sits upright in 170 fsw (52msw) of water. It sank immediately after the Baker blast. The hull is covered with a fur of wire coral (14), which reaches out several feet into the surrounding water. Several torpedoes can be seen



inside through a breach in the pressure hull. The rangefinder and forward guns are especially picturesque on this wreck.

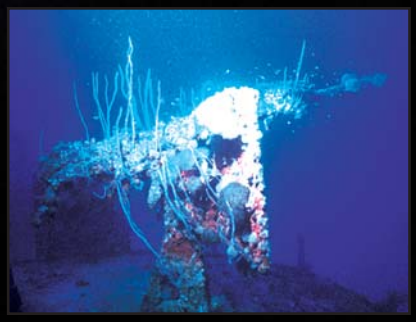
Swimming down to the HIJMS Nagato, one immediately feels dwarfed by the four huge propellers rising from her keel (15). Her massive propellers pushed her at 25 knots, a plus for Admiral Yamamoto when he used her as his flagship during the attack on Pearl Harbor in 1941. The 708-foot (216m) long Japanese battleship was one of the most powerful ever built, with eight huge 16" (41cm) guns. The Nagato is an easy wreck to penetrate, but can be disorientating because she sits upside down in 170 fsw (52msw). (16)


16

One of my favorite dives was the USS Lamson (DD367).(17) This destroyer has much to offer, with its torpedo launchers (complete with partially ejected torpedoes), anti-aircraft guns, and bomb testing structures. It also offers an advantage in that the best sights are outside, for those who are uncomfortable with penetrations. The wreck is 341 feet long (104m) and sits in 162 fsw (49msw).


17

The USS Anderson (DD-411) rests on her side in 177 fsw (54msw). She earned 10 battle stars during World War Two, serving in such famous locations as the Coral Sea, Tarawa, Midway, Guadalcanal, and the Solomons. China spilled from her galley can be found resting on the sand near the bridge, and many large fish may be seen inside her vacant interior. At 348 feet (106m), she is slightly longer than the Lamson.



One of the highlights of the trip to Bikini Atoll does not even involve diving. The last day, when you are limited to one dive because you will be flying 24-hours later, you board the dive boat and travel to Shark Pass. This cut in the atoll provides a place where the lagoon waters exchange with the ocean twice a day. Because of this hordes of hungry sharks are found there. It is an amazing sight to see them swarming around the cut, hundreds strong, patrolling the water looking for food. The staff fishes from the bow of the boat, and feeds the sharks they catch off the stern... a truly memorable afternoon!

As you leave Bikini Atoll, you realize that a week is not long enough to fully explore her secrets. It is a place of history, of wonderment, of repressed and hidden suffering, and of natural and manmade beauty. The dive operation is well run, the staff friendly and helpful, and I much prefer the new management to the old. I look forward to returning....

Jeff Bozanic serves as the Executive Director of Island Caves Research Center, a non-profit organization formed for the purpose of conducting scientific investigations in submerged cave systems. His research diving activities have taken him to the Bahamas, Palau, Guam, Mexico, Canary Islands, Antarctica, and other worldwide locations. Jeff was certified as a NAUI Instructor in 1978, and as a technical diving instructor in 1983. He is active in teaching cave, wreck, rebreather, nitrox, technical nitrox, and trimix diving courses. He has published extensively on diving education topics, with heavy emphasis on cave diving safety techniques. He has edited/reviewed many diving textbooks, and is the author of Mastering Rebreathers. He has served on several Boards of Directors in the diving community, including as Chairman of the NSS-CDS and as Vice Chairman of NAUI, and as Treasurer on the AAUS Board.

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JOHN J. BOLAND JR
LAKE ERIE

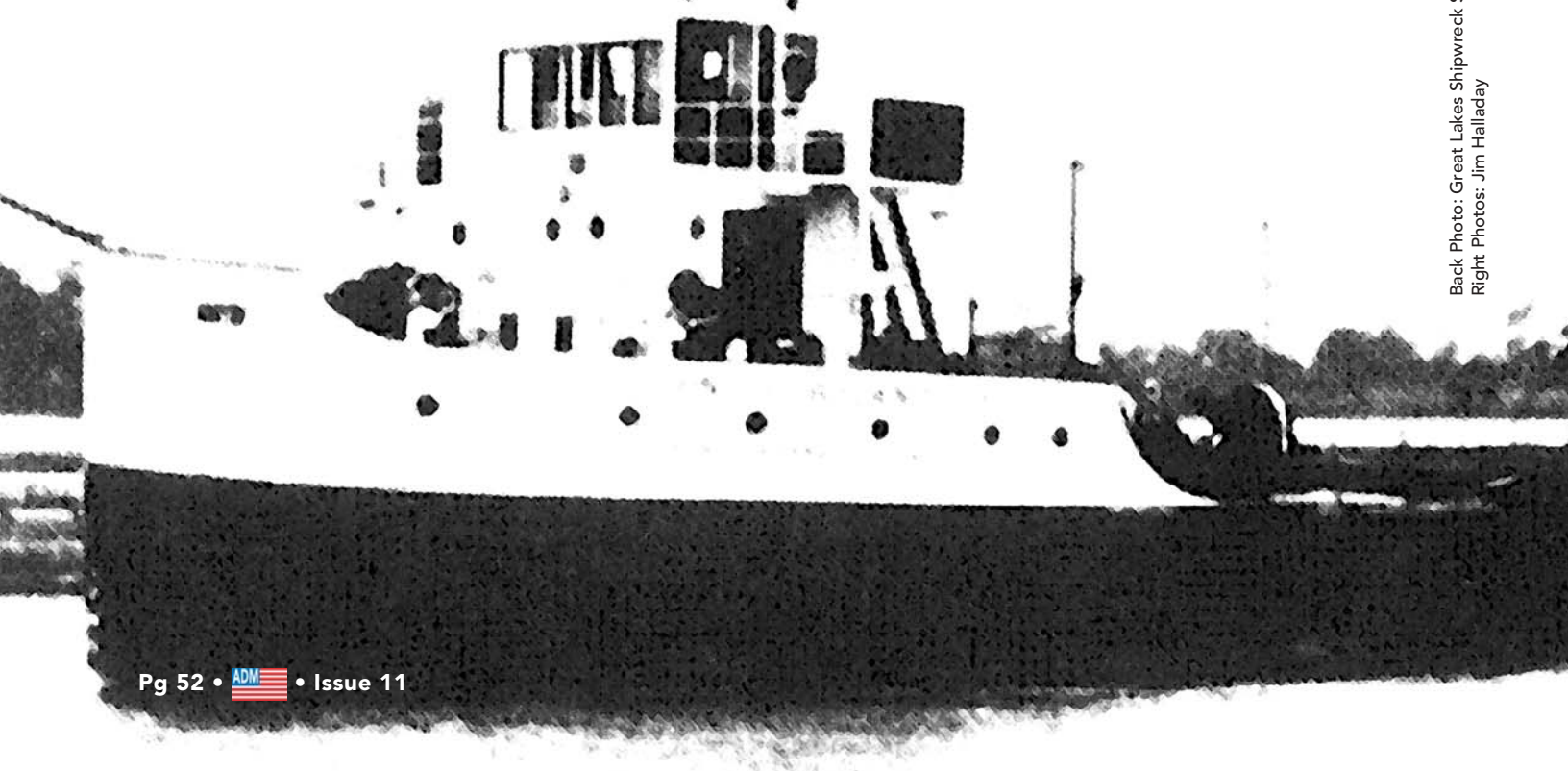
By: Jeff Barris

It is no wonder why a wreck diving trip to Lake Erie conjured up visions of history for me -- days when wind-filled sails and coal-fed engines propelled tons of cargo-laden vessels across its liquid thoroughfare. That's because wooden schooners, paddlewheelers and bulk freighters that once shared the surface of this huge inland sea now litter Lake Erie's featureless underwater terrain like the floor of a child's room cluttered with discarded toys. Lake Erie's clear and timeless depths reveal a historic evolution of largely intact vessels that physically display early shipbuilding in its original form. Knowing that these "long lost" time capsules could be viewed up close -- suspended in their eternal slumber at the bottom of the fourth largest great lake -- I decided to check out one of these "time capsules" for myself.

My day of stepping back in time began early. Through word of mouth, I managed to locate a great little operation nestled in the small, coastal town of Barcelona, New York, that is home to Osprey Diving Charters and the dive vessel Southwind. Her brightly-painted hull immediately caught my eye as I pulled into the marina. Up close, she's a squeaky clean, 48-foot, aluminum crew boat, that boasts enough deck and cabin space for up to 15 heavily geared wreckdivers. The vessel is also equipped to handle both recreational and technical diving.

Her owner, Capt Jim Herbert, greeted me bright and early with a friendly smile and a firm handshake at the dock. Upon receiving a thorough briefing on the day's scheduled dive, Jim showed me his filling station. It's neatly perched inside a portable trailer, a few short steps from the boat. Peering inside, I stared in total amazement at the incredible orchestration of neatly aligned hoses, gages and stainless steel lines leading to and from a bank of tall cylinders, dispensing oxygen, helium and argon. Here, I discovered that divers with the proper certifications can obtain custom gas mixtures to safely explore any depth found in Lake Erie -- even up to the 210-foot limit located in the Eastern part of the lake.

With all our gear properly stowed, the Southwind left her berth and quietly motored out along the rock jetty leaving the protected harbor and entering the lake. "This is a lake?" I thought! It looked more like the Atlantic Ocean to me. Beyond the Southwind's bow appeared nothing but a vast expanse of water, defined



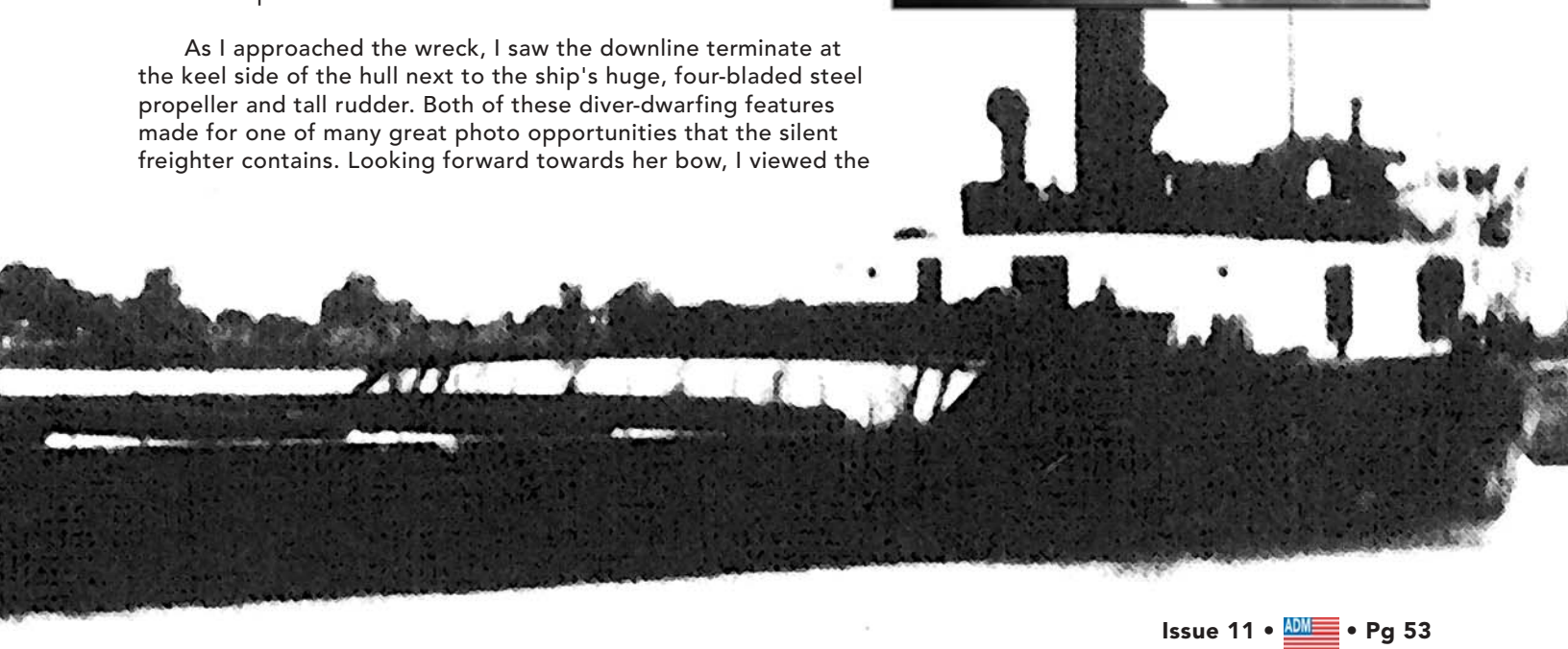
Back Photo: Great Lakes Shipwreck Society
Right Photos: Jim Halladay

only by the horizon, miles to our north. Even more impressive was Erie's picturesque shoreline that flanked us on both sides with an almost endless border of towering rugged cliffs, accented in lush green foliage among a lunar-type landscape of scattered, rocky crags that guarded its fortress like coast. As we neared the teetering turn buoy, Captain Jim set his course, slowly wheeling the Southwind helm to port. Our destination was the wreck of the John J. Boland, Jr. #1.

Located only 7.3 miles off Barcelona, New York, the ship rests on her starboard side in 140 feet of fresh water. After a seemingly short jaunt, I arrived at the wreck site. This site, along with many others, has been conveniently marked with mooring buoys enabling easy access to the wrecks below. Additionally, concrete mooring blocks are used in conjunction with many of the buoyed sites. These huge blocks are carefully set in place several feet off the wrecks; and lines leading from the surface through the blocks and finally terminating at the wrecks provide easy navigation for visiting divers. This proven method assists in preventing damage from boat anchors and grapnels, thus preserving the nautical exhibits below.

With a breathtaking mountainous mosaic as a backdrop, divers can perform an effortless, giant stride from the Southwind's stable deck into an awaiting aqueous mass. I was assured that during the summer months, warm, 70-degree surface temperatures soothe a diver's gear-laden body as he or she slowly descends into the lake's abyss towards the resting hulk below. Passing by the 80-foot mark, I breached an obvious thermocline that immediately enveloped my senses with a stunning deluge of head-numbing, 38-degree water. Because it was a real eye opener, I had to hold onto the line until I acclimated. Upon catching my breath, a noticeable improvement in visibility occurred. On this day visibility was more than 40 feet. However, according to our Captain, this was far from the 100 feet of gin clear visibility that is typical on most days -- allowing video and still photographers to capture an outstanding collection of underwater memories. Jim attributed this change in clarity to a recent storm that stirred up the bottom. But being from New Jersey, the visibility was 20 feet more than I was used to, so I didn't complain.

As I approached the wreck, I saw the downline terminate at the keel side of the hull next to the ship's huge, four-bladed steel propeller and tall rudder. Both of these diver-dwarfing features made for one of many great photo opportunities that the silent freighter contains. Looking forward towards her bow, I viewed the



Boland resting completely on her starboard side, poised more towards turtle, with her partially collapsed wheelhouse and bridge nosing into the barren, sandy bottom. Thick colonies of thumb size, water filtering, zebra mussels coated the entire wreck, like a massive ice cream cone dipped in chocolate sprinkles. Marine life here was healthy, but scant compared to ocean environments. Perhaps, this was due to the frigid bottom temperatures. However, I did see several tiny inhabitants hugging the hull's contour for protection, while larger fish searched the sand bottom for food. Casually finning forward along her intact hull, I found evidence of a perfectly preserved vessel. It was hard for me to believe she'd been resting on the bottom for more than 70 years. Several brass fixtures and intact portholes, accompanied by the majority of ship's appurtenance, were still secure in their original positions and awaited my examination. I could look, but I couldn't touch! Local laws currently prohibit the removal of any artifact from the wrecks lying within the waters of the Great Lakes. This should help preserve these massive wrecks for generations of divers to come.

I discovered that penetration into the silent freighter can be made through several of her open hatches, doorways and into her large holds. Nevertheless, extreme caution and careful planning were a must. Piles of fallen debris and hanging cables were strewn throughout the silt-filled ship creating a deadly snare for any unsuspecting diver that ventured inside. After exploring the wreck to my heart's content, the chilly bottom temperatures sent me kicking up to the thermocline for instant warmth and relief.

Note: This is an advanced dive for experienced cold water divers using drysuits. Divers interested in travelling to Lake Erie to explore such wrecks can choose from a plethora of dive charters surrounding the lake's several hundred-mile circumference, which border the states of Michigan, Ohio, New York, Pennsylvania and portions of Canada.

History of the John J. Boland, Jr. #1:

On October 1,1928, shipbuilders Swan, Hunter, and Wigham Richardson began construction of the Tyneville, later renamed the John J. Boland, at their Neptune Shipyards in Newcastle, Great Britain. Miraculously, the steel bulk freighter was completed only a few months later. On March 24, 1929, she was released from dry-dock to begin her career carrying various natural resources that were indigenous to the region. Her overall dimensions were 239x 43 x 17, and her tonnage was approximately 1149 net tons. She was equipped with a triple expansion engine that delivered 750 horsepower and two large coal-fired scotch boilers, which provided the steam to thrust a single screw freighter forward along the straits and narrows of the Inland Sea, better known as the Great Lakes. Constructed primarily to haul bulk freight, the Boland plied Lake Erie from Buffalo, New York, to Montreal, Canada, carrying mostly grain products and pulpwood. According to her master sheet, the John J. Boland originally started her life as the Tyneville, but quickly lost her name after being purchased by the Sarnia Steamship Company of Sarnia, Ontario. This company, along with the American Steamship Company, was owned by John Sr. and John Jr. Boland. Both men persevered in the shipping business and were seriously looking to add another vessel to their blossoming fleet.

Just prior to the winter of 1932, the Boland ceased her usual grain runs and began transporting coal from Erie, Pennsylvania, to Hamilton, Ontario. Most of the time, the coal would be overflowing from the Boland's six holds, spilled by the tons over her narrow deck. This was a common practice, as long as suitable freeboard prevailed. On October 4, 1932, the John J. Boland arrived at the protected Erie loading docks to take on her usual load of coal. Again, she would find her holds choked full with the black rock. However, because of a long line of other awaiting vessels, she was hurried to shove off and make way. Upon clearing Erie harbor, the Boland entered the lake and turned towards her destination of Hamilton,

Ontario. The weather was calm, along with similar lake conditions. But later that morning, at around 3 o'clock, strong southwest winds began to blow fiercely as the freighter headed north. The captain was advised of the adverse lake conditions as sizable waves of water were now beginning to break over the Boland's main deck that began entering her unsecured hatches. Her crew scrambled to secure the hatches from which the coal bulged. Overloading hampered their task. Her crewman continued to labor intensely about the coal-strewn deck in an attempt to batten down her hatch covers. Eventually, five out of six hatches managed to get secure. Two hours later, conditions increasingly worsened and water steadily scoured the narrow deck. Captain Hawman mustered his crew in an attempt to secure the final open hatch, which was blocked by the enormous load. Wave after wave smashed the freighter causing its hold to fill with more water. Less than an hour later, the Boland began listing to starboard. Captain Hawman decided to steer his vessel back towards Erie, but the freighter did not respond.

Several more huge walls of water hit the freighter and continued to fill the open hatch as the lake unleashed its mighty fury upon the helpless vessel. Without a sign, a violent shift in the deck cargo tossed the freighter onto its starboard side. The crew frantically scrambled to the lifeboats and watched in horror as their vessel sank, taking four of their fellow crew to the cold depths of Lake Erie. The remaining survivors barely managed to make it ashore in the lifeboats. Today, the John J. Boland Jr. rests in 140 feet water, 7.3 miles off Barcelona, NY.

Special thanks to the following for their assistance with this article: Capt Jim Herbert of Osprey charters (www.osprey-dive.com); Jim Halladay, explorer/underwater photographer; Marc Beaudry, explorer/videographer; Carla Lavigne, Great Lakes Historical Society; Georgann and Mike Wachter, authors of Erie Wrecks; and Captain Dan Crowell of Seeker Video Productions (www.deepexplorers.com).

Hidden Worlds
Continued from page 43

Our next destination is Tak Bi Luum, Mayan for Hidden Worlds. Buddy veers to the left, taking a fork off the main road, and the jungle begins to grow thicker. We pause briefly to examine the entrance to Mundos Escondidos. This funnel into the rugged limestone, narrower than Hilario's Well, is a favorite access point for the more knowledgeable local cave divers. Although they take a perverse sort of pride in rarely agreeing on any one thing, these local divers do by common consensus describe this as THE most beautiful cave dive in the area, which is to the three longest underground rivers in the world. I extract a promise from Buddy that we will return, and we proceed another couple of kilometers through the dense bush until we emerge in the center of a large clearing, apparently in the middle of nowhere. The entrance to Tak Bi Luum is Indiana Jones country. We stand on an underground island, 30 feet beneath the jungle floor, surrounded by mirror-calm water, which stretches in all directions as far as we can see. A giant ceiba tree angles lazily through the collapse which forms the roof opening directly overhead, framing blue sky and exotic bromeliads. Just within the overhang in front of us lies a massive formation of stone that somehow clings delicately to the cavern ceiling. This is the loltun, the Mayan stone flower of the cenotes, and this particular one is easily the size of a Brahma bull formed by water, one drop at a time.

I look over at Buddy and say, "Let me guess: snorkeling, cavern and cave diving?"

"Nope," he grins. "High-adventure snorkeling, cavern and cave diving!"

Back aboard El Animal, we roar and bounce our way back to the junction with the main road. We are bound for our actual dive destination of the day: the twin jewels of the Batcave and Dos Ojos. Buddy expands my knowledge of the park as we draw steadily nearer to this plum of plums. Discovered by cave divers Jim Coke and Johanna DeGroot in 1986, these cenotes were virtually inaccessible to the general public until the early '90s, when the first road was cut into the jungle. At that time, only diehard cave divers and explorers entered this sanctum with any regularity. Gradually, as the formidable task of exploring the system progressed, the idea of bringing in open-water divers and snorkelers to experience these natural wonders became a practical reality. After pioneering the guided cavern tour in Dos Ojos more than a decade ago, Buddy has been gratified to see it become an industry standard in this part of the world. As he pointed out, this is an unparalleled opportunity for open-water certified divers, as well as snorkelers, to participate in the thrill of discovery on the edge of the diving frontier. For cave divers, of course, Hidden Worlds is like dying and going to Cave Heaven -- it would literally take months or years of daily diving to see everything there is here. Buddy mentions one actual example: two diehard cave divers who have retired to this area to dive their hearts out, they actually do dive every other day -- and always come back smiling. I bet they do.

Finally, the time has come: we pull up to the small clearing set among guarumbo and zapote trees, home to the Batcave, in a cloud of dust and startled dragonflies. It only takes a few minutes to unload and assemble our gear and struggle into our wetsuits. Then I descend into the nether regions that the Maya called Xibalba: the gateway to the underworld. Standing on a wooden platform surrounded by impossibly-clear water, I gaze up at the slice of blue sky and vivid green vegetation that is the entrance, while Buddy lowers our tanks down The Hole to me on a rope. It is a far cry from Cozumel, that's for sure, and it is hard to believe we're only a short hop and a skip away. The decoration in this cavern is fantastic. There are glistening stalactites and columns of all shapes, sizes, and colors -- and that's just above water.

After a short briefing we step over the edge of the platform and into one of the three longest underground rivers in the world. Unreal. There is no way to properly describe it. The current is so delicate that we are able to hover completely motionless and weightless, surrounded by centuries of stone that are frozen in all conceivable shades of turquoise, aquamarine, indigo, and brilliant white. The visibility is the most extreme I have ever experienced, and it is easy to forget that we are actually underwater--like flying over the surface of Venus, I think to myself. Brilliant blue light streams in at us from two opposite directions, the two Ojos, or eyes, of this unique and spectacular cenote. The effect is to render everything we see peculiarly sharp-edged and preternaturally clear. I am instantly hooked. I find myself running the risk of losing my regulator due to my jaw hanging open.

For the next two hours, Buddy has a field day with me, gradually revealing more and more of the secrets of this underground wonderland, but he need not bother I know already that I will return again and again to the Hidden Worlds.

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Giant Pacific Octopus
Continued from page 37

Sex and the single Giant.....

Generally, males reach sexual maturity at approximately 26 pounds in weight and females at approximately 44 pounds. This will normally occur between two and three years of age. When a female is ready to mate, it is believed she releases chemicals into the water column that in turn attract males to her. In the Pacific Northwest mating normally occurs in the fall and pairs can often be sighted during that time. The third right arm of the male is modified with a sexual organ (ligula) that may develop to be fully 1/5 the length of the entire arm, (small wonder humans often find themselves envious of the Giant Octopus!). The ligula is used by the male to insert two large spermatophores (up to 1 meter in length) into the mantle of the female, who then stores the sperm in them for later use. Males may mate with multiple partners, but females appear to be selective -- preferring larger males to smaller ones. Females will seek out a secure, rocky den and lay their eggs approximately two months after mating. Between 20,000 and 80,000 eggs are laid over a period of several days and are attached to the ceiling and walls of the den itself. The female will then remain in the den with her eggs, constantly cleaning, tending and aerating them with her siphon. She will not leave the den; even to seek out food for herself, despite the fact that incubation of the eggs can take as long as between five and seven months. When the time arrives, she will induce the eggs to hatch by manipulating them with her arms and suckers. Her last act will be to blow the larvae out of the den with her siphon. E. dofleini females die immediately after the hatching of their eggs, having sacrificed all of their strength and energy in caring for their brood. Males are also not long-lived, and may survive only several months beyond mating. Generally, females live approximately three and a half years with males around four years. After hatching, larval octopuses are approximately the size of a grain of rice and swim upward to become part of the heavy surface layer of plankton. There they will remain until they have reached a size at which they are capable of surviving on the bottom of the ocean -- usually after about 6 weeks.

And now, back to our story.....

In the distance the bright sunlight glistened off the snow-covered slopes of Mount Rainier virtually blinding us with its intensity, as Sparky and I strode off the Misty's stern platform and dropped into the rich, green depths. By previous agreement we halted our descent at 90 FSW and started a slow zigzag search pattern up the face of the wall looking for signs of octopus activity. As our lights scanned the rocks, the beautiful colors stood out as if a mad artist had splashed his paints across them in a frenzy -- the ambient sunlight filtering through the brown kelp adding to the overall effect. From the corner of my eye, I saw my buddy snatch up a rock crab in anticipation of using it to tempt our prospective quarry out of its den. Midway through the dive I saw what we were hoping to find -- a small opening in the rock face with a trail of crab and clam debris falling away from it like an expanding fan. Pausing by the opening of the den, my light briefly danced around the interior. Someone was home! A large, rectangular eye surrounded by a dense tangle of suckers and arms peered back at me, the large mantle moving in and out with each breath. The size of the mantle and the largest suckers visible told us that it was a fairly large example of *E. dofleini*, probably between 60 and 80 pounds. Our host's body colors and texture changed repeatedly as we attempted to get better views or to make physical contact.

Don't try this at home, folks.....

As my buddy extended the crab toward the den entrance, the Giant's colors again immediately changed. Shortly, the tiny tip of a single arm began to snake out of the den, inching its way toward the tempting morsel. The color changed again as first contact with the crab was made and overall interest clearly increased. The tip of the arm began to wrap its way slowly around the crab, but Sparky slowly pulled the crab just out of reach. Within seconds additional arms began to creep out of the den as reinforcements. They, too, attempted to encircle the crab -- only to have it again tantalizingly withdrawn. This impasse continued briefly for a while, each time a little bit more of the octopus coming into view. Suddenly, apparently deciding that enough was enough, the Giant literally poured out of the den like an expanding pool of oil, its arms wrapping around the crab and also extending up my buddy's forearm.

The game now took on an exciting new dimension! Being the kind of guy he is, Sparky pulled the crab back

toward himself, the octopus immediately flowing toward him with its arms still attached, its mantle and leg webbing billowing out in an effort to expand its appearance and intimidate him. Literally face to face, the two rotated around as if in a dance, each of them embracing the other. This Giant clearly didn't have a problem playing with us, so long as a delicious crab was the ultimate prize! For longer than we would have ever dreamed possible the octopus remained with us, his arms crawling up and down my buddy's torso and equipment as if gathering information for future reference, his colors seemingly changing with each new "discovery". As the two of them shuffled about the bottom my camera shutter clicked happily away. The situation remained at this entertaining juncture until we began to approach our planned bottom time. Reluctantly, at that point Sparky released his hold on the crab and the Giant happily dragged it back into his parlor for a triumphant feast, (provided by an unpaid waiter!).

As we ascended toward the beckoning surface I occasionally glanced back down toward the den and its now satisfied occupant, wondering what the Giant inside was thinking about our just concluded encounter. Was it celebrating its triumph, pondering its place in the world, or just wondering "What the hell was THAT all about?" *E. dofleini* had once again interacted with some more of those odd bubble-blowing creatures from the surface and seemed to have had a great time in doing so.....what exactly do they think of us?

As I once again broke through the waves into the sunshine, I saw that Sparky had made it to the surface a few moments prior to me. The grand story had already begun for those on the stern of the boat..... "Man, you should've seen that big guy come boilin' out of that hole! He was lookin' at me.....I was lookin' at him....."

The author would like to extend special thanks to Seattle Aquarium Marine Biologists Roland C. Anderson, PhD., and Jeff Christiansen for their assistance and input regarding the content of this article.

U.S.S. WILKES-BARRE
Cleveland-Class Light Cruiser / Key West

By Jim Holt

About an hour boat ride from Key West, in the middle of an ocean often swept by ferocious Gulf Stream currents, lies the wreck of the USS Wilkes-Barre, CL-103 at a depth of up to 250 fsw. A highly decorated United States warship, she now lies in two pieces on the ocean floor, visited only by the sea's many life forms, fishermen's nets and lines and the occasional adventurous, trained and prepared technical diver.

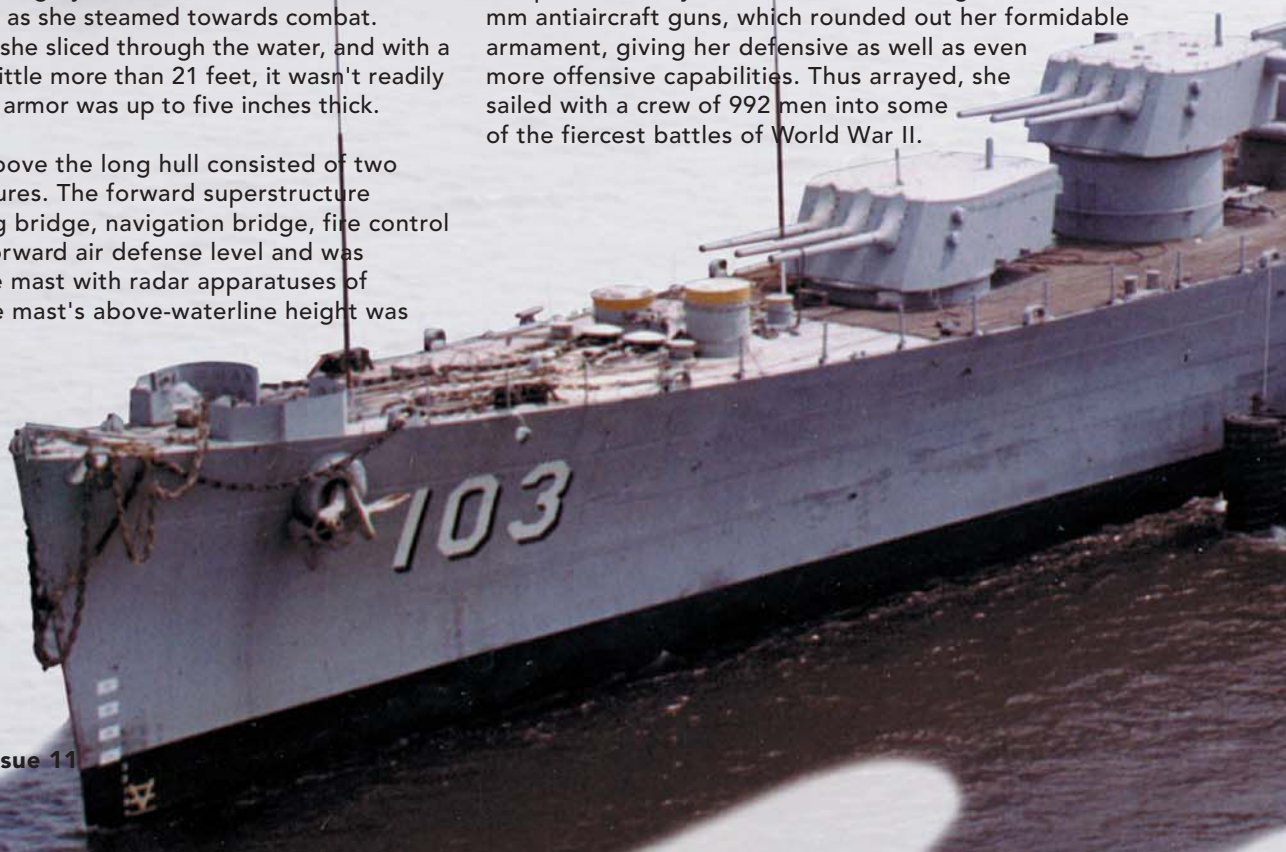
On the day before Christmas, December 24, 1943, in the middle of a frantic, ambitious effort to build much-needed ships for the U. S. Navy, the Wilkes-Barre was commissioned in the Camden, New Jersey, shipyards. It took only a year to build and launch this Cleveland-class light cruiser. Upon its christening, the ship that soon set sail from the New York Shipbuilding Company's yard was anything but defenseless -- and its complement of armaments would not have to wait long to be tested in battle.

After being totally fitted out and readied, the Wilkes-Barre under the command of Captain Robert L. Porter, Jr., USN left for a shakedown cruise in local waters and in the West Indies. Then it was on to San Diego, California, by way of the Panama Canal. At 610 feet in length, her 10,000-ton steel hull -- painted in wartime camouflage patterns of light gray, dull black, dark blue and ocean gray -- enabled her to blend in with natural conditions as she steamed towards combat. Looking svelte as she sliced through the water, and with a draught of just a little more than 21 feet, it wasn't readily apparent that her armor was up to five inches thick.

The profile above the long hull consisted of two large superstructures. The forward superstructure contained the flag bridge, navigation bridge, fire control station and the forward air defense level and was topped by a large mast with radar apparatuses of various kinds. The mast's above-waterline height was barely under the 126 feet needed to clear the Brooklyn Bridge while sailing at high tide. This superstructure ended in one of two large smokestacks. Just aft, the profile plunged down towards the main deck, rising to the second smokestack, adjoined and followed by the aft bridge and air defense levels. Topping this was another mast with radar arrays and a 36-inch searchlight.

Finally, at the stern, an airplane crane stood tall with its purpose to hoist and maneuver the Kingfisher spotting planes. With a maximum speed of 175 mph, these planes carried a pilot and an observer and were armed with two 30-caliber machine guns -- one fixed in the nose and the other on a flexible mount for the observer. Fitted with a central float under the fuselage and two off-board stabilizing floats, these monoplanes were lifted onboard by the crane after operations and then lowered onto a catapult, which launched them on missions of reconnaissance and rescue. The Wilkes-Barre's aviators rescued more than one downed American pilot in the waters of the Pacific.

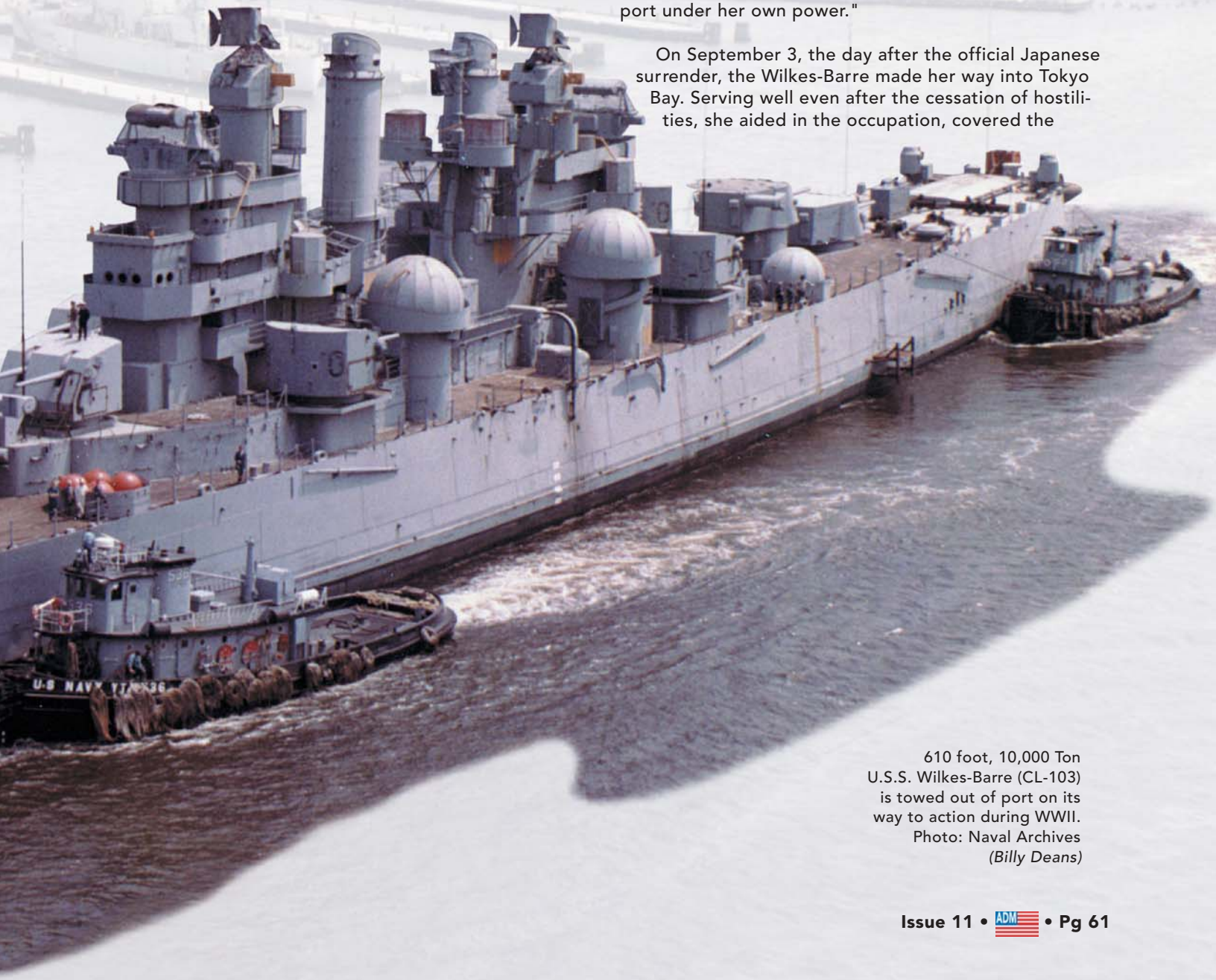
Completing the profile was the weaponry that helped give the Wilkes-Barre the nickname the "Lethal Lady". Twelve six-inch guns and a dozen five-inch guns gave her a deadly offensive punch. This was nicely complemented by 20 40-mm antiaircraft guns and 10 20-mm antiaircraft guns, which rounded out her formidable armament, giving her defensive as well as even more offensive capabilities. Thus arrayed, she sailed with a crew of 992 men into some of the fiercest battles of World War II.



To say that the Wilkes-Barre and her crew served with heroism and distinction would be an understatement. In a relatively short time span of eight months in the Pacific Theater, she earned four Battle Stars, shot down seven enemy planes, assisted with four others and had three air-sea rescues while putting over 103,000 miles of sea behind her stern. This record begins to put the ship's wartime accomplishments in perspective. The cruiser took part in many bombardments, shelling the enemy at Iwo Jima, Okinawa and French Indo-China. Three days prior to the amphibious assault on Iwo Jima, carrier-based bombing strikes were launched on Japan as a diversionary tactic -- hitting Tokyo for the very first time since General Jimmy Doolittle's daring raid almost three years earlier. Taking out airfields and destroying industrial sites, it was the Wilke's duty to provide a defensive escort for the aircraft carriers that launched the planes.

It was later with another aircraft carrier that the Wilkes-Barre earned fame and demonstrated exceptional valor. On May 11 two Japanese kamikazes, or suicide planes, were able to penetrate clouds of ack-ack, antiaircraft flak laid out in the Pacific sky by American sailors desperate to avoid the burning annihilation that these death bombs brought. The two that got through the screen plunged to their death into the aircraft carrier USS Bunker Hill, going deep into her decks, hitting aircraft on the flight deck, and in the hangars below, igniting their aviation fuel. The Bunker Hill quickly became a floating inferno, leaving it crippled, devastated, and aflame, with crewmembers trapped with no means of escape. It was into this situation that the Wilkes-Barre and other ships steamed. As the Captain of the Bunker Hill later said, "They came alongside, not knowing whether we were likely to have explosions aboard." And alongside they went, with the bow of the Wilkes-Barre hard against the hull of the stricken carrier, laying down streams of firefighting water, rescuing trapped men, and evacuating the seriously wounded. Later, after the Bunker Hill reached port, a "Time" magazine article stated that the ship "ranked next to the Franklin as the most cruelly ravaged ship to ever reach port under her own power."

On September 3, the day after the official Japanese surrender, the Wilkes-Barre made her way into Tokyo Bay. Serving well even after the cessation of hostilities, she aided in the occupation, covered the



610 foot, 10,000 Ton U.S.S. Wilkes-Barre (CL-103) is towed out of port on its way to action during WWII. Photo: Naval Archives *(Billy Deans)*

May 12th, 1972
Naval testing off
Key West splits the
USS Wilkes-Barre
in-half.

seizure of midget submarine bases and oversaw their demilitarization. Five months later the ship was ordered home and sent on good will cruises to Norway, England, and Cuba, and it also participated in Navy exercises and Navy Day Celebrations. Finally, on October 9, 1947, the U.S.S. Wilkes-Barre was decommissioned and put in mothballs in Philadelphia, never to see active service in the Navy again; however, she was to be called into another service, one that the Wilkes-Barre faithfully serves today.

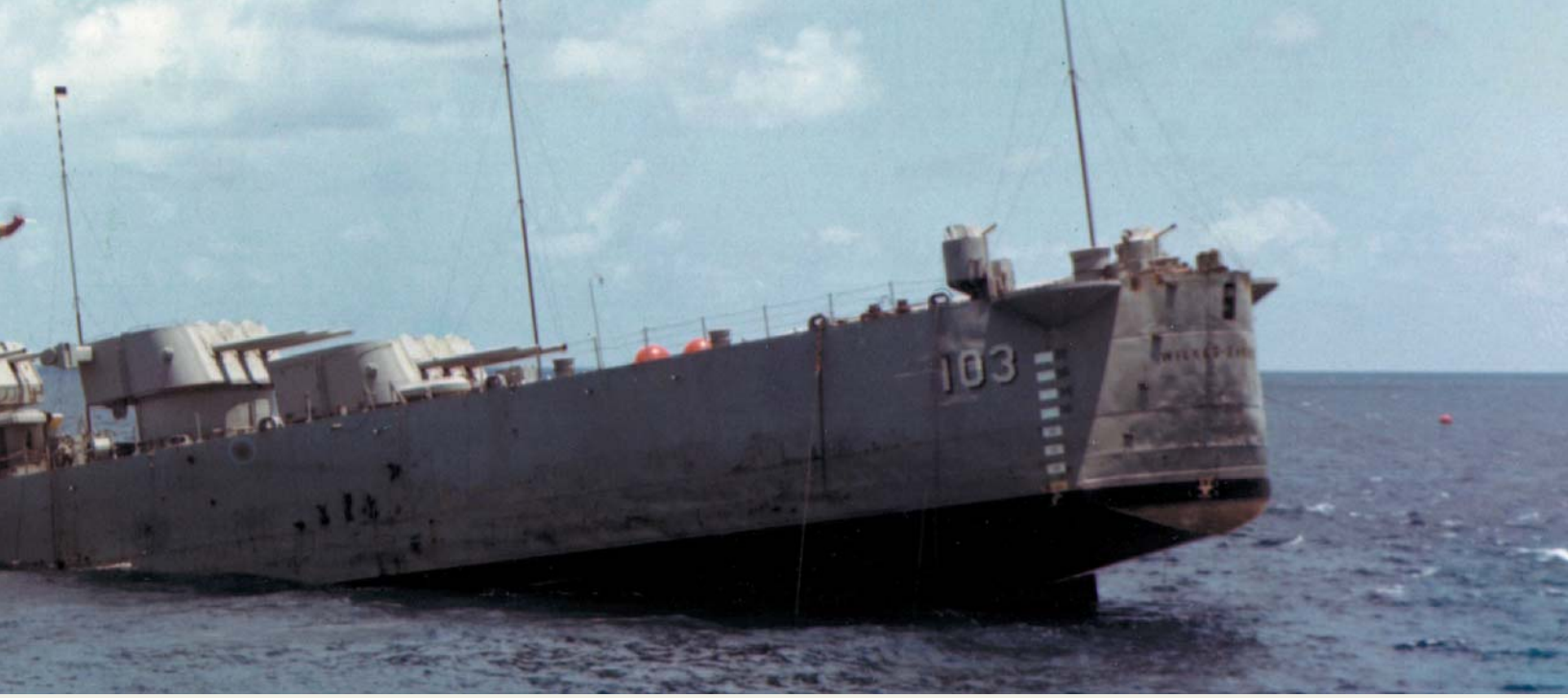
In the early 1970s after being stricken from the Navy Register and cleaned of pollutants, the Wilkes-Barre was towed to the waters off Key West, Florida, for her final voyage: the bottom of the sea. Originally intended to be a target for underwater explosive tests, a Rear Admiral -- who also happened to be obsessed with sport fishing -- exerted his considerable influence on the Coast Guard. His influence enabled her to be sunk in shallower waters so that she could serve as an artificial reef.

On May 12, 1972, as the explosive charges were set off, the Wilkes-Barre split into two, breaking apart between the twin stacks and superstructures. The explosives had done their job, but the valiant ship was not ready to sink. As water filled the two halves of the hull, two ends of the wreck hit the ocean bottom at 250 fsw. The stern section finally sank at 10 p.m. that same night, landing in an upright position. It actually took a second round of explosives the following morning to do likewise with the bow half, which finally came to rest on the sea floor on its starboard side. In the process of sinking the ship, a large gun turret was torn off, which now lies about 50 feet off the starboard side of the bow. The capital warship's relief rises up to 140 feet from the surface. The "Lethal Lady" had reached her final resting place, where she has remained undisturbed save for the fouling by fishing nets and the comings and goings of the local sea life that began to call it home.

By the late 1970s there was a lot of blue water fishing going on in the area. The fishing boat captains were aware that there were targets sunk here, but since the names of the sunken ships had already been lost and forgotten, they were referred to as the 325-foot wreck, the 315-foot wreck, the 400-foot wreck or the 240-foot wreck. One of these captains, curious as to just what was down there, gave local Florida Keys deep diver Billy Deans the Loran numbers of the one at 240 feet.

In June of 1978 equipped with a tow board, a large underwater flying wing rigged with 440 feet of aircraft cable, Billy Deans and his dive buddy John Ormsby arrived at the site. The tow board had the capability of dragging a diver down to 200 feet extremely rapidly, "like an express elevator" according to Deans. Their fathometer had malfunctioned, but onto the tow board went John, whose free diving capabilities were already legendary. After making a few passes of the area, he was the first diver to see the unbelievably stunning site that was the wreck of the Wilkes-Barre. After surfacing he said that he "felt like an aviator, flying over a massive ship, with tons of fish on it." And that it was "like being on top of Everest."

That was all it took. The excitement and the lure of the unknown ship motivated the pair to keep diving, and Billy and John dove the wreck almost every day for the next three weeks. Because their tanks were filled with the state-of-the-art diving gas of the late '70s, namely air, some interesting conversations took place topside after a dive. "Did you see three guns, or did you see two?" would be a typical post dive exchange. Diving on the stern section, they were taken by the sheer size, and the incredible amount of features that the wreck contained, but a lot of questions remained to be answered, not the least of which being what was the name of the ship that they were diving on.



For the first couple of years diving on the Wilkes-Barre, the dive team didn't enter the wreck. Slowly but surely they explored and built their experience and honed their procedures. Staying on the stern section, they began mapping her and taking videos of the impressive wreck. One day a deep ocean upwelling led to incredible visibility of 300 plus feet. It was then that the bow section of the ship, up until that time hidden in the enshrouding curtain of visibility, was finally revealed. Of course this led to even more diving and exploration. Much research was done, and plans were obtained for a sister ship, the USS Atlanta, CL-101. They finally knew the name of the ship they had been diving on.

Diving on air from 220 fsw to 250 for those times, of course, presented large operational difficulties. The pair utilized the then current U. S. Navy Air Tables, and added an extra five minutes to the bottom time and 10 feet to the maximum depth. Still, they would come up from many of these dives extraordinarily tired, no doubt from excess Nitrogen still in their systems. There had to be a better way, and they were soon to find out what it was.

Driven by a desire for safer decompression the answer was finally found, and it was oxygen. What is now a widespread, common operational element of technical diving is today in place because of those very dives that were being made on the Wilkes-Barre, and Billy Deans and John Ormsby's wish to make their dives safer. Utilizing PO2 tables from the U.S. Navy, and realizing that the limits were most important thing, they quickly discovered a world of difference in not only their decompression times, but in their increased operational capabilities and the decreased stress on their bodies. After implementing the oxygen, the divers dove 25 days straight on the wreck, such was the boost they were given. Venturing up the eastern seaboard, the pair went on to dive the Andrea Doria, bringing their O2 deco equipment and procedures with them. The local wreck divers looked at all the newfangled Oxygen equipment that John and Billy brought with raised eyebrows and skepticism. But it wasn't long before these very divers were asking, "Would it be all right if we used your oxygen on the next dive?" Oxygen decompression had arrived on the scene. Tragically and sadly, John Ormsby perished on one of the Andrea Doria dives, due to entanglement; however, his legacy lives on today for all technical divers.

After the death, Billy Deans took about a year off from diving the Wilkes-Barre, only to have his interest renewed after taking an enthused Jim King out to her. By now he had started to bring some friends and qualified people out to see firsthand this behemoth on the bottom. More were to come.

Soon after the original Wakulla project in 1987, Billy Deans contacted Dr. Bill Hamilton, a noted diving table guru, and asked for input. Up to the time, all that had been available to him were the Navy Air and PO2 tables and tables NOAA had just come out with on NOAA Nitrox I. Nitrox II, which was originally going to be 37.5 percent, had not yet been established and implemented by Dick Rutkowski. Utilizing the information and experience Dr. Hamilton had gained on the use of Trimix, and Heliox, Billy Deans put in place another piece of the puzzle: Trimix.

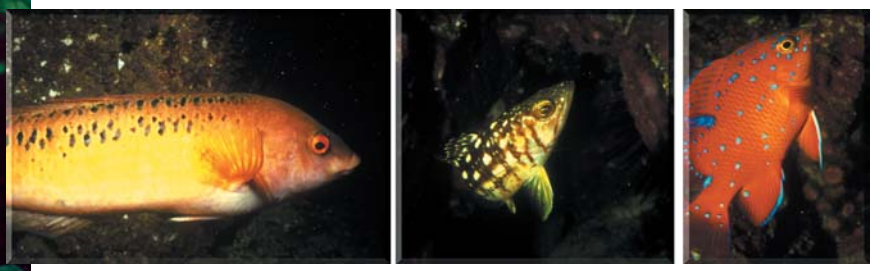
In December 1988 the first Trimix dive was made on the "Lethal Lady". The difference was night and day. As Billy Deans said, "It was like the lights came on." With the clear head that Helium afforded him, he launched on even more ambitious dives, using a light Helium mix. At that time, a mooring ball was installed on the site, as well as a 55-gallon plastic drum, painted predator black, making it harder to discover. This streamlined the operation. Divers no longer had to go down to make sure the hook was set. Today for divers visiting the wreck, the mooring is long gone, which means that a grappling hook has to be utilized.

Continued on page 71

Photography and Text
by William M. Mercadante

FACTORS INFLUENCING THE PROLIFERATION AND DISTRIBUTION OF GIANT KELP (Macrocystis pyrifera) ALONG THE COAST OF SANTA CATALINA ISLAND, CA.

What is the significance of figuring out where giant kelp will grow and what factors influence that growth? Well the answer is many fold. First, it would be fairly safe for me to say that the Giant Kelp plant has affected everyone in the United States, either knowingly or more likely not knowingly. In fact, the giant kelp plant has been both an ally and an enemy to the human race, and has even aided as a catalyst in killing some individuals. Around 1917 and 1918, Macrocystis was harvested in amounts exceeding 400,000 wet tons per year for conversion into a substance called potash. This substance, which the Webster's dictionary defines as a "potassium or a potassium compound esp. as used in agriculture or industry", was used to manufacture gunpowder during the First World War when German sources became scarce. Other fields of thought are that the potash was used as a source of fertilizer during the war. In either case kelp harvesting activities were at an all time high during this time period due to the increased need for the production of explosives. The next breakthrough in kelp technology came about in the 1920s with the realization that kelp was the main source of algin, which is a highly efficient stabilizing, thickening, suspending and gelling agent. This discovery can be attributed to the work of the late E.C.C. Stanford in 1883. Today many products contain either algin or carrageenan (another kelp derived product). A few commercial examples include products such as Carnation low fat milk, Jell-O pudding, Yoplait yogurt, Duncan Hines brownie mix, and Kraft Italian Salad Dressing, just to name a few. Not only do humans rely on Macrocystis pyrifera for many extracted substances, but this alga also provides a unique habitat for many interdependent organisms. The holdfast that is composed of haptera has been studied and reveled to contain over 150 different species. Another study that was conducted on the fronds found 114 invertebrate species present. So even though Macrocystis does not provide a nursery for the spawning of any sport fishes, it does provide a safe haven for juveniles and many vertebrate and invertebrate species. The giant kelp plant can be compared to rain forests on



land. There is so much life concentrated in such a small area that conservation measures are imperative to the survival of so many co- dependent species. Knowing what factors influence the distribution and proliferation of this alga will help in its conservation as a unique biome, due to the enactment and protection in the form of establishing marine sanctuaries.

Geographic Range of Macrocystis pyrifera.

The giant kelp plant has an exclusive range that occurs along the Pacific coast of Canada, the United States and Baja California.

Macrocystis forms the most extensive submarine forests in the world, and is very pronounced around the eight Channel Islands off the coast of California. Santa Catalina Island was chosen as a test site for studying the distribution and proliferation of the giant kelp plant due to the existence of previous survey data, as well as the plethora of microhabitats the unique relief of the island provides.

The factors that contribute to making Santa Catalina Island a good test site for studies on Macrocystis distribution and proliferation.

As a result of its geologic past, Santa Catalina Island has a very mountainous and rugged terrain, with a central ridge that represents the maximum height of extruded molten schist. The island lies in a region of tectonic activity with a dry climate, which previous studies by Kirkpatrick et al. in 1988 determined to contribute to the formation of high relief landscapes. The island lies in a NW to SE plane and has a 450-600m central ridge. The orientation of the island along with its high relief central ridge causes great differences in sun insulation, especially between the protected leeward side of the island, as compared to the windward southwest facing side. The perceived effect on the windward side is that of a reduced day length due to shading caused by the island's central peak. This shading is not present on the windward side. In addition, the island's 54-mile coastline is highly dissected with small bays, points and other coastal features. This hill shading combined with the locally irregular coastline, variable submarine depths, a spatially heterogeneous atmosphere due to the maritime influence, and differential fog and cloudiness on the windward and leeward sides results in a wide range of microhabitats with respect to light and other environmental parameters.

Past studies on Macrocystis pyrifera biomass surrounding Santa Catalina Island.

A system called GIS (geographic information system) was used by Bushing in 1994 and 1995 to reveal significant differences in kelp distribution due to different "disturbance regimes". These regimes were influenced by temperature, sedimentation in the water column, bottom bathymetry, light attenuation, substrate composition and many other factors. Measured values in 1996, which indicated that the central ridge of the Island reduces light levels at the sea to air boundary layer significantly in the near shore environment of the protected leeward side of the island. GIS was also used in obtaining the kelp distribution that resulted in areas of hillside shading. What is the significance of light values at the air / sea boundary? All plants photosynthesize, or change energy from the sun into essential compounds for growth. The alga Macrocystis is no exception. Since this was considered one of the major, if not the major influence on the distribution and proliferation of the giant kelp, the influence of sun insulation needed to be investigated. Besides shading caused by topographic highs and the angle of incident sun rays, light is reduced in intensity as a result of depth due to scattering and selective absorption. The amount of scattering of light rays is proportional to the turbidity of the water column. The more turbid the water the more scattering and light attenuation occurs.

Current research on the distribution and proliferation on Macrocystis pyrifera around Catalina Island.

Since light is a critical component that is needed for plant or alga growth, the hypothesis that Macrocystis pyrifera will exhibit growth patterns on the shaded protected leeward side that maximize its duration in the sun lit areas was tested. For example, it would be expected that giant kelp would grow distances further from the shoreline on the leeward side of the island to maximize insulation that would not be attenuated by shading due to the island's central ridge. This of course will also be effected by the off shore slope and bottom topography, since depth is a limiting factor on Macrocystis growth due to reduction of light levels in deeper waters. The limiting depth is that depth which will support the plants gametophyte and sporophyte stages. Also one would expect a shift of kelp growing sites to areas around points and reefs where shading effects would be less pronounced. The results obtained from measurements of insulation values in comparison to areas of kelp growth can then be utilized to choose proper areas for marine sanctuary protection.

Methods used to study the proliferation and distribution of Giant Kelp around Santa Catalina Island.

GIS layering was incorporated to test hypothesis with respect to the effects of shading on Kelp distribution. Several individual layers were needed to be mapped and then combined to obtain the overall picture of conditions under study that effect kelp growth. These individual layers mapped by Bushing in 1994 were kelp bed distribution, terrestrial elevation, bathymetric depth, submarine aspect, submarine slope, bottom relief, distance from shoreline and solar insulation. A combination of the digital elevation model and bathymetry model were used to model the topographic surfaces of Santa Catalina Island from a depth of 100 fathoms (183m) to the Island's highest point on Mt. Orizaba (639m). This was the model that incident light intensities were based against. Differences in instantaneous light intensity at the air / sea interface as well as at depth were measured within a GIS layer in 1994 and 1995. It was shown that there is a significant difference between the incident light levels received on the leeward protected side of the island and the windward, unprotected side. Therefore Macrocystis pyrifera distributions and proliferation should be different on the leeward side in comparison to the windward side if insulation is the main driving force that dictates regions where growth will occur. Many studies on insulation of light as it is effected by topography have been conducted with respect to terrestrial species, however not many have been focused in regards to marine species. The actual algorithm that was used for insulation values was known as TOPQUAD, because it is well suited for studying areas considered to have high relief. White light is composed of many colors of the spectrum. Photosynthesizing organisms however do not use the entire spectrum of light but only a small band known as PAR (or photosynthetically active radiation) in the 400 - 700 nm range. Modeling similar to that of Weiss et al. in 1988 was utilized in that insulation was modeled for the 21st day of each month to create intervals of a monthly basis between solstices and equinoxes. Insulation values were then averaged in three-month intervals, due to the high correlation of successive month insulation values. This gave what was considered by Bushing to be a "seasonal" image. A twelve-month model was also computed to give an annual estimate. To take into account the effects of local turbidity in the decrease of light that reaches depth through the water column a GIS layer was composed from the TOPQUAD algorithm to give a model for bottom insulation values. This model was based on the assumption that the deepest depth that Macrocystis pyrifera could grow was to a depth where only one percent of the surface insulation value of light was present which is considered the boundary of the photic zone. The maximum depths at which Macrocystis occurred on the leeward and windward coasts determined relative turbidity values. The maximum depth of giant kelp occurrence in addition to the application of Beer's law (determines the extinction of light through a medium) determined bottom insulation values that corresponded to respective surface values.

In addition to turbidity, insulation is dependent on a value known as aspect, which is related to the position of the kelp plant with respect to other kelp of the same species. Increased relief along the bottom of the ocean shelf gives rise to wider ranges of aspect and differing exposures of Macrocystis to slope variations and therefore differing light microclimates. A depth limit of 20 fathoms was established for both the leeward and windward sides of the island for the maximum depth that Macrocystis could grow. This value was determined due to light limitations, and the area between this contour and the corresponding shoreline was the potential area for giant kelp growth. Overlay techniques were utilized to correlate data from the various different GIS layers (submarine aspect, depth, slope, bottom relief, etc.) Values for kelp frequency as well as percent coverage were then determined from each data layer. The definitions of Kelp frequency and percent coverage as used by Bushing are as follows: Kelp frequency refers to the percentage of total kelp along the coastline for a given data value or range (e.g. 5 percent of all kelp on the West leeward coast was found at surface insulation values of 150 to 160). The phrase percent cover refers to the percent of the corresponding photic shelf covered by kelp for a given value of an environmental variable (eg. 20 percent of all 8 m depths on the West windward coast were covered by kelp).

Conclusions and Summary

Many factors affect the amount of light and its intensity that interacts with waters surrounding the Island of Santa Catalina. These differences arise due to seasonal variability, turbidity of the water column, and shading due to topographically high features. These factors seem to have an effect on the distribution and proliferation of the brown alga Macrocystis pyrifera around the island. Hill shading due to the topographically high central ridge of the island causes a substantial reduction in light values on the leeward side of the island and in effect causes a 30 percent reduction in day length. Kelp on this leeward protected side favor areas of higher than average surface and bottom insulation values. In comparison, the windward side of the island is more uniform in regard to surface and bottom insulation values due to the absence of the hill-shading phenomenon. In general, the kelp beds on the windward side are larger and this can probably be accounted for by the increased amount of insulation that is available for the growing kelp sporophyte. Macrocystis also grew further away from the shoreline on the leeward side, which supports the fact that hill shading has an impact on kelp distribution. This displacement assures that the surface canopy receives sufficient amounts of incident radiation in the PAR region to promote growth through photosynthesis. Also, Macrocystis seems to be associated with areas of high bottom relief on the leeward side indicative of offshore reefs where light levels are usually higher. In comparison higher light levels are associated with moderate bottom relief on the windward side because of the sheltering effect of the bottom from storm surge, and associated turbidity caused by storm generated sediment flux of the bottom. This factor seems to dominate the greatest influence on the distribution of kelp on the unprotected windward side.

Sources of possible error in determining the distribution and proliferation of Macrocystis pyrifera around Santa Catalina Island.

The most probable sources of error in determining the distribution of Macrocystis are those associated with the various modeling techniques and algorithms that were used to construct GIS layers. The terrain GIS layer is critical in that if there are any errors in this data set they are carried throughout all of the other steps in the modeling process as well as in calculated values based on the terrain layer. Bushing determined in 1994 that terrain layers composed to represent areas of high relief such as Catalina Island require high special resolution to accurately model "fine-scale topographic variation". He also notes that the models that were used assumed an average albedo value however, in most cases "the vegetation on east-facing leeward slopes is often dense scrub or chaparral, which is less reflective than the barren, sparsely-vegetated windward slopes", which further exaggerate differences cased by hill shading. Differences in wave action and the corresponding effect on reflection of electromagnetic radiation off the water surface could be yet another source of error.

About the Author:

William M. Mercadante currently is working towards a PhD. in Marine Science at the University of South Carolina. He currently has a B.S. in Biology from Ursinus College as well as a B.S. in Marine Science from the University of South Carolina. If you would like to support marine research and see more of William's work please visit his web site www.LivingArtPhotography.com. His sponsors include Kodak, Aquatica, DUI, Carae, Backscatter, E-book, Zero Limits, Berger Brothers, Light and Motion, ARM computer, Lowepro, Modern Postcard, Patco Products, Lindblad Expeditions and South Carolina Web Designs.

DIVING THE SALEM EXPRESS

470 Fatalities

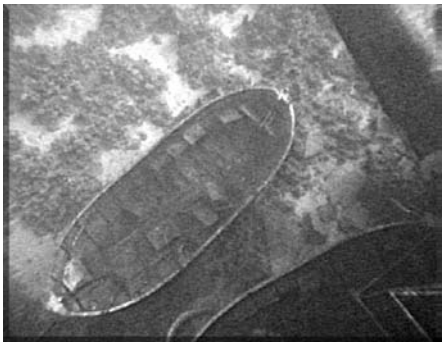
By John Duggan

Underwater Photos taken from U/W Video Captures

The wreckage of the Salem Express is a fascinating but almost eerie site, since the modern-day ferry went down only 10 years ago. Because the ship sank so quickly, very few people - only the strongest swimmers - were able to survive.

Aboard the Red Sea Aggressor and under the guidance of Captain Ramey, a highly qualified retired SEAL from the Egyptian Navy. The first day of my 10-day diving cruise was spent observing and filming the outside of this interesting ship. This particular day, our second day, was to be spent penetrating the ship to see what was inside.

ONE OF THE UNUSED LIFEBOATS

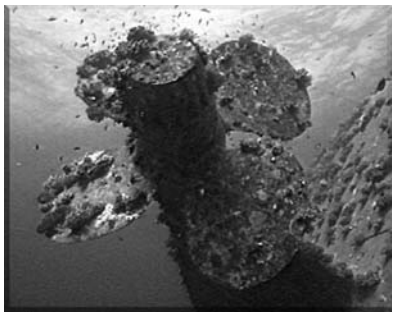


As we approached the ship, I could see the unused lifeboats sitting on the bottom of the sea. Nearing an open hatchway, a strange, creepy feeling engulfed me. Out of the 20 divers on board The Aggressor, only three of us accepted Captain Ramey's offer to go inside and see the residue of so many lost lives.

Built in 1976 by a French shipbuilding company, the ferry was initially named the Fred Scarmaroni and went through several name changes before becoming the Salem Express in 1988. Her gross tonnage was near 5000, and she drew about 15 feet of water when empty. Four engines powered two large propellers that drove this vessel through the water.

BARNACLE ENCRUSTED PROPELLER

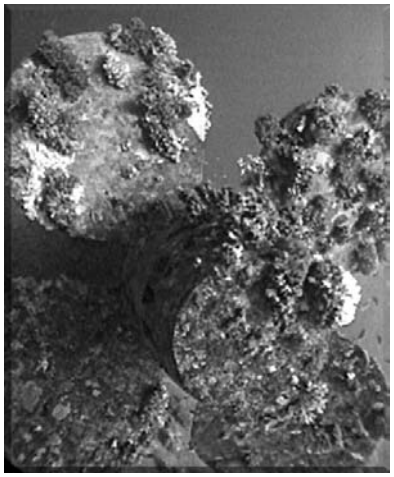
The Salem Express was transporting several hundred passengers and a number of cars from Jeddah (a port in Saudi Arabia) to Safaga (an Egyptian city in the Southern Red Sea) when her fatal accident occurred. Many passengers were returning from a religious pilgrimage to Mecca, the holiest city in Islam. Besides the cars, the holds were filled with luggage and the passengers' worldly possessions. These pilgrims must have been extremely happy at having completed the once-in-a-lifetime trip to Mecca that is required of all Muslims capable of making the journey.



The Captain of the ship (Hassan Moro) was a highly qualified seaman and had made this trip numerous times. The ship departed Jeddah on December 16, 1991, for a trip of more than 400 nautical miles to Safaga. It was a stormy night with gale-force winds creating huge waves. The crowded ship (figures estimate that more than 600 individuals were on board) was at the mercy of the elements as it fought toward the Egyptian coast and then started its northward voyage along the coast toward Safaga. The vessel would have to pass the dangerous Hyndman Reefs on its approach to Safaga. The skipper had taken a shortcut to the port by sailing between the Egyptian coast and the Hyndman Reefs. This route was hazardous even under the best of conditions, but on this particular night, this decision would prove fatal.

While navigating his ship along this narrow passage, the captain drifted east of his intended route and struck the southern part of the reef. This resulted in a breach in the starboard (right) side of the ship, which by itself was probably manageable. Unfortunately, the collision also caused the bow visor (this lifts up to allow cars to drive on and off the ferry) to open up. A similar occurrence would happen years later to a Scandinavian ship in a storm with the same catastrophic results.

Enormous amounts of water entered the vessel causing a list to starboard which flooded the car deck. The stricken vessel stalled and



Photos taken from video captures, sorry about the quality.

began to sink. The storm continued to batter the ship and the fear onboard turned into panic. The Salem Express sank in 20 minutes.

Many of the passengers were trapped below; others were swimming for their lives in the angry sea. Not a single lifeboat was successfully launched from the ship. Battered by the sea and without the advantage of lifejackets, the unfortunate people grimly fought the raging water. The one lucky aspect of this terrible night was that the prevailing current was taking people toward shore, allowing some of the strongest swimmers to survive. All-in-all approximately 180 survivors made it to shore. Other boats that were moored on the lee side of the reef system were unable to help due to the large waves caused by the storm. The official number that died that fateful night was 470.

Why did the Salem Express try this hazardous route in such turbulent weather? Why weren't any lifeboats launched? Was the ship overcrowded? The answers to these questions went down with the ship and its skipper.

Body recovery from the water and the ship itself went on for days. Eventually, the search was abandoned and the vessel was sealed wherever possible to prevent disturbing the bodies that were never recovered. Even today, very few divers actually enter the wreck itself.

Most of the belongings of the ill-fated passengers are still onboard, possibly to provide comfort to the lost souls in their afterlife. After all, Egypt has historically been the land where vast quantities of wealth were set aside for the comfort and use of nobles and pharaohs in their next life. A tomb is a good description of what it felt like inside the ship.

PERSONAL BELONGINGS

The wreck lies on its starboard side in just over 100 feet of water southeast of Safaga. It is a large wreck, since the Salem Express is over 300 feet long and 50 feet wide. The ship's insignia is a large S inside a wreath that depicts the ownership of the Samatour Shipping Company.

INSIGNIA ON FUNNEL

Upon my dive I noticed that both anchors were still secured, and the bow visor was raised. Empty lifeboat davits were complemented by a like number of lifeboats sitting serenely on the ocean floor.

RAISED BOW VISOR

The 100-foot plus visibility made it easy to see large segments of the ship at one time. The large propellers silently sat at the bottom — stopped for all eternity.

LEFT PROPELLER & SHAFT

Even though this is a fairly new wreck, coral and other marine growth have started to coat the exterior. A myriad of sea life has made this discarded hulk their home.

COMPANIONWAY RAIL COVERED WITH CORAL

As the four of us arrived at the port side of the ship, we gazed into the darkness offered by the hatchway that had been pried open by some previous divers. Refracted light from the sun penetrated a short distance vertically, but a short movement into the horizontal passageway brought utter darkness.

We glided slowly into the first passageway and saw quantities of luggage — some wrapped in rugs or carried on wheelbarrows. Many of the rugs were colorful and still maintained their artistic beauty.

LUGGAGE CARRIED ON WHEELBARROW

The only light was from our flashlights and my video lights. Moving deeper and deeper into the gloom, we saw more and more of the personal belongings of those that died with the ship. Even a sign in four languages was still visible informing passengers to set the hand brake of their car and lock it.

PULL UP BRAKE & LOCK YOUR CAR

Clothing, children's toys and tricycles, as well as china littered the passageway. After about 100 feet of penetration, a large truck barred us from further progression, so we looked at the human artifacts and started back. A foreboding feeling seemed to descend upon us. This uneasy feeling became overwhelming for one diver in particular, causing the captain to exit to the surface with this individual. This left two of us to decide whether or not to depart or continue with our exploration. Curiosity won out, and we descended down to a deeper passageway.

TEA POT RESTING ON SHELF

While no more dark than the previous area, we continued to feel uneasy as we entered the black, luggage-filled compartment. There was even more debris in this location than above. Previous visitors had opened some of the bags and clothing was scattered everywhere. A delicate silk garment that still held its shimmering beauty had been tossed to the side. As I picked up this garment, a coating of silt flowed off into the water. It was truly lovely and was probably a favorite of its owner. A child's bicycle sat on its side. This toy certainly brought joy to the child that used it, but now sits silently amid the rubble. A profound feeling of sadness filled my chest as I realized I was witnessing the lost dreams of so many hundreds of people.

As we continued on, we saw more and more items, such as refrigerators, stoves, washing machines and other appliances. Finally, two cars — a sedan and station wagon — loomed ahead. The tires were flattened, but the insides looked ready for use. There was the strange feeling that if one climbed in and turned the key the engines would start. The handbrakes were set, but the windows were down and the doors unlocked. Several packages (possibly gifts) were on the back seat of the sedan.

CAR DASHBOARD

We then turned around and sought other passages. Trying several hatchways, we could only get in a short distance before debris or frozen hatches barred our way. A glance at our computers showed us that we had been down almost an hour. The use of nitrox allowed us a much longer than normal visit. Since we were getting short on gas and time, we headed for the exit.

Once in the clear water outside, my emotions seemed to take over. I felt a sense of relief and my breathing seemed to be easier. My dive partner and I headed for the line our boat had affixed to the wreck. As we slowly ascended, we both seemed to be grim. Where was the joy and excitement that usually occurs when diving such an interesting wreck? Maybe the wreck was just too new or the occupants' memories and presence were too strong. Maybe it was just our overworked imagination. As we did our 15-foot safety stop, I took one last glance at the Salem Express: a ship and its passengers that died before their times. Their hopes and dreams for the future had been snuffed out like a candle's flame. It was a good thing that all the belongings had been left on board rather than salvaged. If the old Egyptians were right, then objects like the bicycle are still bringing joy to some small child in another life. Whether one believes that or not, it is still a soothing thought.

U.S.S. Wilkes-Barre
Continued from page 63

It wasn't long before other divers became curious about this new diving gas. IAND (later to become IANTD) began getting requests for Trimix training. So Billy Deans taught a Trimix course at Tom Mount's house. Shortly afterward, through his Key West Diver shop, Billy Deans established the very first open water Trimix courses ever available, and naturally his students wound up training on the sunken decks of the Wilkes-Barre. It was there that many of today's leading technical divers got their formal Trimix training.

One other common technical procedure was to come out of the dives on the "Willie-Bee" as her former shipmates fondly call her. Since higher oxygen content stage bottles were being taken on these deep dives, the dangerous potential for an accidental switch to the wrong bottle at depth needed to be addressed. Though the tanks were already identified and placed, the practice was started of putting something over the regulator mouthpieces on the high O2 bottles -- such as a piece of surgical tubing -- so that the diver couldn't get a proper seal on the mouthpiece. Therefore, he or she would only inhale gurgling water if they mistakenly switched to the wrong gas at the wrong depth. This would force them to look down at the mix they had mistakenly switched to and get on the right gas at the right depth. This has led to the introduction of many different devices by the dive industry at large to help prevent a deadly switch. One can begin to see that today's technical divers all owe a debt of gratitude to the early divers on the Wilkes-Barre.

Over the years, Billy Deans has logged more than 600 dives on the Wilkes-Barre. Some people half-jokingly say that he has probably spent more time on her decks than the sailors that actually served onboard the ship. He has penetrated and explored the ship extensively, laying many lines in the process, eventually laying line down to the very bottom of the hull, saying that "There was a lot of rust and fine, fine silt."

That being some years ago, it is believed possible that some of those deep areas may now well be buried by silt. There have been some close calls and memorable experiences. Once John Ormsby was swept off the wreck by a strong current, but the surface support personnel that were always on the boat saw the yellow bag and picked him up. Another time Karl Shreeves, now vice president of technical development at PADI, was also swept off with his dive buddy. Fortunately, they too shot their lift bags, which were seen. One very lucky diver, ascending from his 200 plus fsw dive switched to his 100 percent pure oxygen cylinder at his 110 foot stop and continued to breath it at his 100 foot and his 90 foot stops before convulsing. Unbelievably, he was brought to the surface, put on surface Oxygen and quickly transported to the hospital where he was put in the recompression chamber, emerging from there asymptomatic after omitting shall we say just a few deco stops.

Conditions at this world-class wreck vary widely. Visibility can range from two to three feet to up to 300 plus feet. Currents can be non-existent or strong enough to suck down a 500 pound lift bag.

One diver descended in such a strong current that it took a long time and a lot of effort just to pull down to the ship. By the time he finally made his way down the greatly stretched out anchor line, it was almost time to ascend. A boat captain can easily let out 300 to 350 feet of anchor line on a "good" day. Temperatures also vary considerably, ranging from tropical paradise conditions -- like 80 degrees -- down to 42 degrees Fahrenheit when deep-welling ocean currents come up from a nearby 600-foot ledge. Typically, temperatures range from the mid-60s up to 75 degrees. There is no best time of year to dive it, although winter often brings worse sea states and some wind. A dive trip out to the Wilkes-Barre also involves another variable. Even with the best technology onboard, a captain may be hard-pressed to be able to guarantee that a diver will be hooked onto the stern or the bow section. Either dive is incredible, yet most people seem to want to dive the stern section.

A little over 50 yards from the stern lies the bow section on its starboard side. Descending onto the section's port side and swimming over to the vertical deck and its large guns, divers can experience a separate wreck dive from the stern section. In addition to the guns, the bow section features the separated turret off in the sand, the gaping hole that this left behind, as well as the break, chains, the bow itself, and numerous opportunities to penetrate.

Today, the wreck is a veritable garden. Encrusted with resident colonies of sea urchins, gorgonians and oysters, it acts like a magnet attracting all kinds of sea life. One can encounter large Lemon sharks, huge Jewfish, big schools of Amberjack, Cuberas snappers and even big shells. There have been reported sightings of Manta Rays, Sperm Whales, Loggerhead Turtles and Whale Sharks at the site. When divers first see the wreck, the animal life is often one of the first things noticed -- other than the sheer size and scale. On the wreck itself the life gets macro, including schools of small baitfish.

One of the most popular features of the "Lethal Lady" has to be the guns. Whether it's the massive triple gun turret on the stern or the gun turret lying 50 feet off the bow section in the sand, they are sure to make a vivid impression. The breaks between the two sections are an attraction as well, especially when observed from below. Here you can see firsthand a real cross-section of the ship, albeit with some twisted, mangled, distorted metal. The hangar at the stern where the Kingfisher planes were lowered is another popular spot and probably one of the easiest areas to enter. Penetration is possible from this point, as well as many other spots on the Wilkes-Barre, including open hatches. Luckily for visitors this wreck has not yet been scavenged for too many artifacts, although some items have definitely been salvaged. Portholes remain, including some with glass intact, as well as numerous instruments and gauges. The ship's bell was put on display for many years at its namesake town of Wilkes-Barre, Pennsylvania, until one day it fell out of the mounting, crushing the legs of a spectator before finally being removed from view.

Located in the same area as the Wilkes-Barre and lying in deeper waters, are other shipwrecks such as the USS Fred T. Berry (DD-858), the USS Saufley (DD-465), and the USS Kendrick (DD-612) which were all part of the Navy's testing and were intentionally sunk. Also nearby is the wreck of the S-16.

Because of the very nature of the dive, a lot of preplanning is needed before attempting a dive on the Wilkes-Barre. Safety concerns, as well as equipment and operational concerns, must be addressed. In addition to the depth and the strong, unpredictable currents, there are lots of fishing nets and monofilament on the wreck. The usual hazards of wreck penetration diving also apply. As with other dives of this magnitude, divers should not only have the required training, but experience built over time. As Billy Deans would say, "Build your experience base slowly." He would also tell you to not lose sight of one other very important thing. Whether diving open or closed circuit, "It's supposed to be enjoyable".

Dive Operators To Contact:

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www.paradivers.com

Captain's Corner Dive Center
305-296-8918 www.captainscorner.com

Get Wet Key West
305-294-7738

Special thanks to Captain Billy Deans, aka "Dr. Deep," and Larry Wright of Paradise Divers.

Jim Holt started diving in 1966 in Southern California. Trained by some of the early L.A. County and NAUI instructors, he was certified in 1968 in Pebble Beach.

After building experience, he started doing exploratory dives in the outlying areas of Indonesia. A pre-existing love for all sea life was potentiated with a penchant for deep diving, and he sought out Technical training. His first Trimix dives were with a Navy SEAL. Qualified to dive different rebreathers, Jim can often be found diving his Cis-Lunar Mk-5P, whether in the Bahama's Blue Holes, or the waters off Southern California, and Hawaii. Video and cave diving round out some of his underwater pursuits. Currently he owns and operates Blue Freedom Divers, based for the time being, in Southern California. Here he continues to teach recreational and Technical diving.

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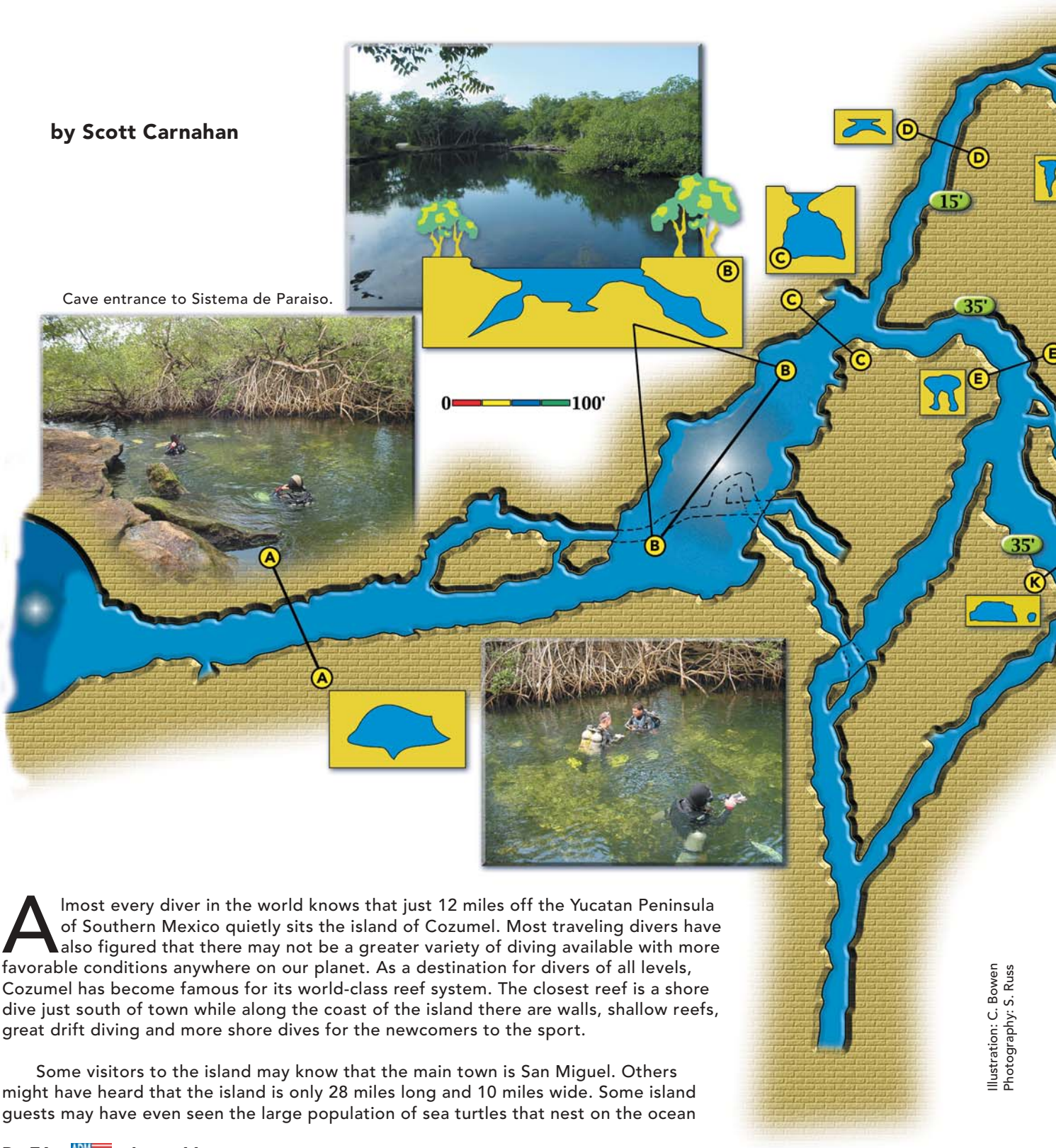
Sistema de Paraiso
Cozumel, Mexico

by Scott Carnahan



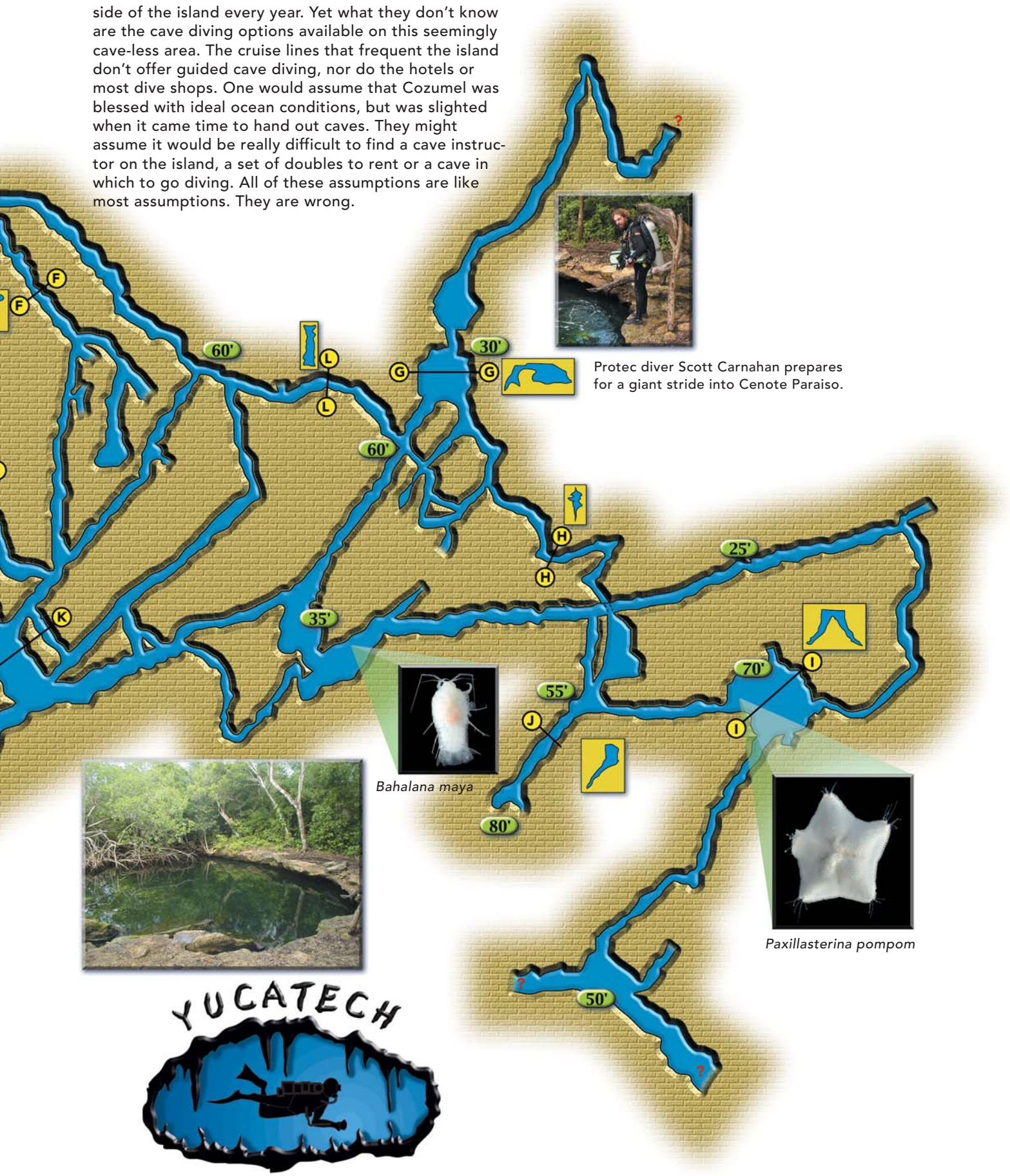
Cave entrance to Sistema de Paraiso.

Illustration: C. Bowen
Photography: S. Russ

Almost every diver in the world knows that just 12 miles off the Yucatan Peninsula of Southern Mexico quietly sits the island of Cozumel. Most traveling divers have also figured that there may not be a greater variety of diving available with more favorable conditions anywhere on our planet. As a destination for divers of all levels, Cozumel has become famous for its world-class reef system. The closest reef is a shore dive just south of town while along the coast of the island there are walls, shallow reefs, great drift diving and more shore dives for the newcomers to the sport.

Some visitors to the island may know that the main town is San Miguel. Others might have heard that the island is only 28 miles long and 10 miles wide. Some island guests may have even seen the large population of sea turtles that nest on the ocean

side of the island every year. Yet what they don't know are the cave diving options available on this seemingly cave-less area. The cruise lines that frequent the island don't offer guided cave diving, nor do the hotels or most dive shops. One would assume that Cozumel was blessed with ideal ocean conditions, but was slighted when it came time to hand out caves. They might assume it would be really difficult to find a cave instructor on the island, a set of doubles to rent or a cave in which to go diving. All of these assumptions are like most assumptions. They are wrong.



Protec diver Scott Carnahan prepares for a giant stride into Cenote Paraiso.

Bahalana maya

Paxillasterina pompom

YUCATECH EXPEDITIONS

The island of Cozumel is home to a number of beautiful inland cenotes. Some are large cenotes that are popular swimming holes, while others are just cracks in the jungle floor. On a recent day-trip to the island, Curt Bowen and myself decided to find out the truth about Cozumel and go diving in Cenote Aerolito de Paraiso. This cenote is located only five minutes outside of downtown San Miguel and less than two minutes from the cruise line piers. We felt that in order to really expose the secrets of the island's caves we would need to search high and low for some local professional help, so we called our friend German.

German Yanez is owner and operator of Yucatech Expeditions. He organized our doubles for us, got us our primary lights, gave us a ride to the cenote and even led us in the right direction. German, originally from Mexico City, lives on Cozumel Island, and teaches cave diving year round locally and throughout Southern Mexico. He trains divers of all levels of cave diving on the island, from Cavern Diver to Full Cave and offers certifications through both the NSS-CDS and the NACD. Since 1989 German has accumulated more than 2,000 cave dives in Southern Mexico and trained over 200 Cave divers. On the island he is the local expert, the NACD Safety Officer and the man to talk to about logistics, equipment rentals and cave diving. On a second fact-finding trip to the island, we were additionally assisted by local cave explorers Monstro Pech, Marcus Perez y Schmidt and Mateo.

We met up at the dive shop in the morning to see what the caves had to offer. German was teaching a course and going to Aerolito and, of course, we were invited to come along with him. All of the equipment was loaded into his truck and off we went. Ten minutes after getting into the truck we were parking next to a large cenote, just 10 feet from the water's edge and right on top of the cave entrance. The pleasant flow of water apparently coming out of the rock edge led us straight to the cave entrance, and the yellow stop sign let us know we really were going cave diving on the island of Cozumel. Curt and I traveled through the cave's passageways, through the halocline and across numerous jumps to an area of the cave known as Wonderland. The maximum depth that we reached was just over 60 feet (80 feet is the max depth of the system) and the total duration of the dive was 90 minutes. Throughout our dive we encountered numerous decorated areas with stalactites and stalagmites, at times a tannic layer shimmering above the halocline, and areas covered in a loose algae that added more shape and personality to the cave. The abundant animal life was the most noticeable feature throughout the entire cave dive.

Aerolito, for those who know it, is the most biologically diverse cave system in Mexico. Albino starfish, white feather dusters, spiny stars, sponges, freshwater eels, tunicates, remipedia are just a few of the inhabitants of this extensive cave system sitting on the ocean's edge. Apart from the life inhabiting the cave, the open water area of the cenote is edged by a dense mangrove, which is home to tropical fish, crabs, birds and a large number of land and sea animals that choose to use this protected area as a breeding ground. We did not encounter the resident crocodile that is fabled to live between the cenote and the Caletta, but we kept one eye out during our time in the open water. On the second investigation trip, under the guidance of Monstro, we dove through a different cave passageway nearby. Quietly resting on the cave's floor was an intact skeleton of a large sea turtle whose fate was met amongst the elaborate passages of the Aerolito. This turtle skeleton was in perfect condition, untouched by passing divers and an additional example of the diverse caves of Cozumel Island.

Hundreds of divers pass these caves in their boats every day oblivious to the phenomenon that hides inland behind Paradise Reef, next to the Caletta (the place where almost every dive boat parks over night). This is not a new cave system; Wes Skiles, Jeff Bozanic, Dennis Williams, and Steve Olmoroy originally explored it over 15 years ago in 1984. Previous explorers, with the

help of the NSS-CDS, have installed permanent gold line. Total line in this cave to date is over 64,000 feet. The entire 64,000 feet of this system are accessed through just this one cenote; no other surface points have been connected as of today. Many divers over the years have been diving here and it is currently dove by locals of the island for leisure and ongoing explorations. Never has there been a death in this extensive cave system.

In addition to Aerolito de Paraiso, there are other caves and systems on the island. There are also seven other mapped caves, four of which are sinkholes, which have already been explored. The sinkholes of Cozumel have very small entrances, just cracks in the jungle floor, which makes all of them cave dives due to lack of light and constant overhead environment. All of the explored sinkholes on the island are decorated, contain hydrogen sulfide and are generally tannic at the surface due to the lack of flow. More exploration will be needed to complete the puzzle of the island and connect the caves and history of this island in the Caribbean.

www.cozumel-diving.net/yucatech/

Other cenote dives on the island:

1. Tres Potrillos, 145 ft sink
2. Bamboo, 165 ft sink
3. Roca Bomba, 165 sink
4. Sifa cave system 30,000 feet of line, 30 feet deep
5. Dos Coronas Ocean start, 2500 feet of line, sidemount
6. La Quebrada Chankanaab 70,000 feet of line, ocean and cenote entrances, not open to divers, scientists only.
7. Xcan Ha, 180 ft sink

Cave divers involved include:
German Yanez, Yucatech Expeditions
Curt Bowen, Advanced Diver Magazine
Scott Carnahan, ProTec Advanced Training Facility
Monstro Pech Cozumel Cave Explorer
Marcus Perez y Schmidt Cozumel Cave Explorer
Mateo Cozumel Cave Explorer

Also see Dive Cozumel on page 75

Cozumel Cave Biology by Dr. Tom Iliffe

Isopod *Bahalana maya*

Paxillasterina pompom

Dr. Tom Iliffe
Associate professor of Marine Biology at Texas A&M University at Galveston. For the last 20 years, he has been collecting and describing new marine cave animals and has published more than 100 scientific papers on these investigations.

The island of Cozumel is separated from the mainland of the Yucatan Peninsula by a deep-water channel and thus a shallow water connection between the two has never existed. Due to this isolation, the caves of Cozumel contain a number of species not found elsewhere in the Yucatan Peninsula.

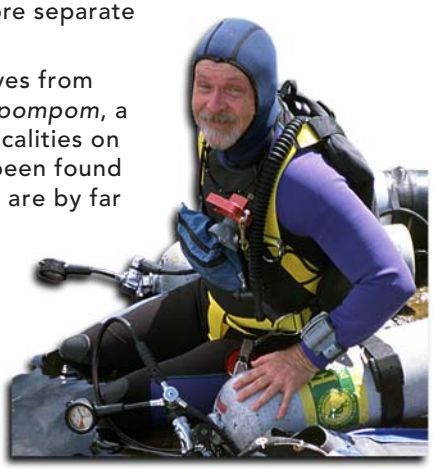
These include 5 species of shrimps and a newly described genus of copepods. Only an amphipod, *Bahadzia bozanici*, and a cirolanid isopod, *Bahalana maya*, are common to caves in both locations. A possible explanation for the dual occurrence of these latter species is that they may be products of convergent evolution whereby an open water ancestor species simultaneous colonized caves on both Cozumel and the mainland and adapted to the cave habitat in a similar manner in both locations.

Bahalana maya is a medium-sized aquatic isopod, up to one centimeter in length, lacking eyes and pigment. This genus contains four stygobitic (aqautic, cave-limited) species. In addition to the Yucatan species, these include two species from caves in the Bahamas (Mayaguana and San Salvador Islands) and one from Cuba.

Yagerocaris cozumel is a small, weakly pigmented shrimp, about 2 centimeters in length. It represents the only species in a new genus, but somewhat resembles the genus *Calliasmata* that includes three stygobitic species, one from the mainland of Yucatan, one from the Dominican Republic and one from the Polynesia (Tuvalu), Hawaii and the Sinai Peninsula.

Agostocaris bozanici is a small, unpigmented and eyeless shrimp, up to 2.5 centimeters in length. This genus includes a second stygobitic species from caves on Grand Bahama, Cat and Andros Islands in the Bahamas and the Caicos Islands, located south of the Bahamas. The Bahamian species is now under study and may be redescribed as two or more separate species.

A completely white starfish found in caves from Cozumel has be identified as *Paxillasterina pompom*, a species previously known only from three localities on the Atlantic coast of Panama, where it has been found under coral rubble. The Cozumel specimens are by far the largest recorded for this species with a body size of 5 centimeters.



Further biological exploration of the marine caves on Cozumel is likely to yield new, cave-adapted species that may shed light on the origins and evolution of life in this unique habitat.

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