Finding the early humans

Discovery of prehistoric remains in the Yukatan

KURT AMSLER

Many prehistoric remains in the submerged caves of Yucatan have been discovered by González's project, such as these bones of extinct horse and camel species

Yucatán

Text by Paul Jeffrey
Photos by Kurt Amsler

Mexico's Yucatán Peninsula is a relatively flat landscape where no rivers flow for the rain sinks quickly into the limestone and runs unseen to the sea. The ground is pocked by vine-draped sinkholes—*cenotes*, as they are called locally—where the roofs of underground caverns have collapsed. For centuries these openings have provided inhabitants with access to fresh water, and the inaccessibility of the deep caves beneath the openings has long beckoned the adventurous, though physical challenges limited how far they could go.

In recent years, however, technological developments in underwater

THIS PAGE: Arturo González and colleague Carmen Rojas investigate the caverns in the Dos Ojos cenote for archaeological remains. At 60km long, it is one of the longest underwater cave systems of the Yucatan peninsula

equipment have made it easier for divers to go farther into the networks of dark tunnels branching out from the submerged caves, and reports began to emerge about this dark underworld and its store of human and animal remains.

Arturo González, a Mexican biologist and underwater archaeologist working with the Instituto Nacional de Antropología e Historia, decided to launch a systematic examination of the flooded caverns in 1999. He worked together with a team of specialists including cave divers, archaeologists, palaeontologists and photographers, who would face technically difficult and physically challenging dives of up to six hours. The multidisciplinary team excavated three human skeletons from the depths, then carefully studied and analysed them. What they found startled the scientific community.

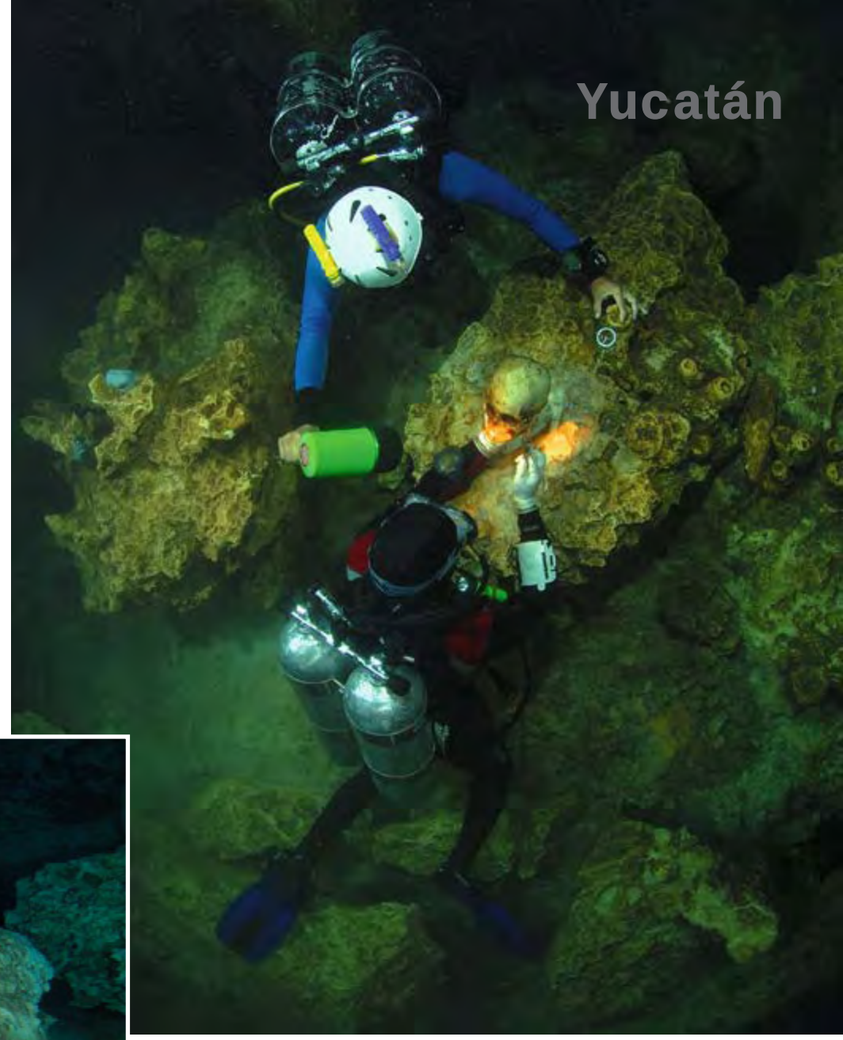
The skeletons are possibly older than any other human remains in the Americas. One in particular has been estimated by three foreign laboratories to be more than 11,600 years old. Furthermore, the skeletons bear no resemblance to the Maya who came to dominate the region thousands of years later, and whose remains and artefacts are found near the openings of the cenotes. If anything, accord-

Arturo González and colleague Carmen Rojas explore the vast caverns of the 60km-long Dos Ojos cenote

ing to González, the newly discovered skeletons have a cranial morphology resembling that of people in eastern Asia. The findings are forcing the scientific community to reassess its theories about when and how early humans travelled to the Americas.

"What we've discovered is a piece in the puzzle of human evolution," says 44-year-old González, who has been director of the Museum of the Desert in the northern Mexican city of Saltillo since 2002. "But there are a lot of other pieces missing from the puzzle. We have one important piece, but it doesn't match any other existing part in a way that would help us understand how early humans colonized the Americas."

González first learned scuba diving as part of his university studies on biology, but it was a National Geographic documentary about the discovery, by underwater explorer James Coke, of an ancient fireplace 30 metres below the surface that inspired him. "For me this was unbelievable," says González. "Caves have always interested me, this space below the ground that for many indigenous groups signifies the mother's womb. When I saw this documentary about fire pits under the water, I began to travel to these areas to explore them. We got to know James Coke, a pioneer in the exploration of these spaces, and he alerted us to other discoveries he'd made. Thanks to him we began to form a project that since 1999 has been making important discoveries about the ancient history of the Americas."



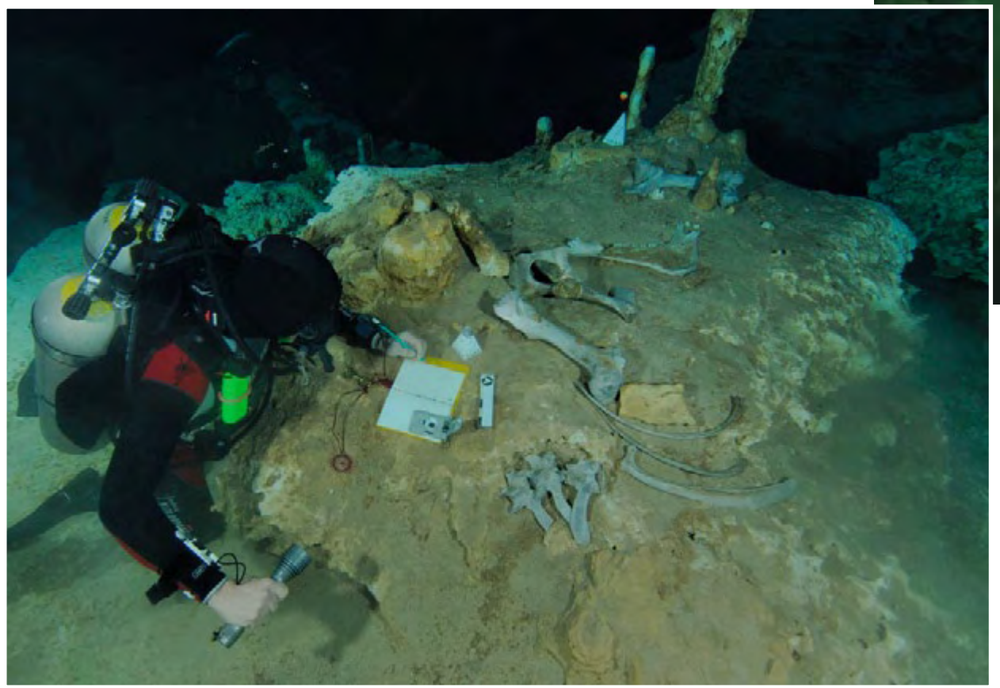
Cave exploration

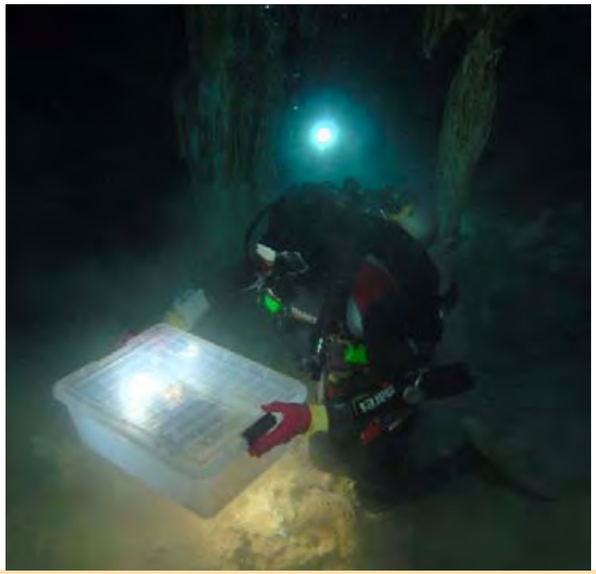
Cave divers and speleologists have been exploring Yucatán's submerged cave systems since the 1980s, collecting geological, archaeological and palaeontological evidence that is now crucial to González. Deep in the caverns, González and his colleagues retrieved fossils that are between 10,000 and 60,000 years old, including those of extinct camelids, giant armadillos and horses. All are from the Pleistocene Epoch, when the Yucatán was covered not with low forests but with dry grasslands. In at least one submerged cave north of Tulum, near the Caribbean coast, the divers found another ancient fireplace, whose carbon traces of partially burned camelid bones suggest that the prehistoric humans there survived in part on the meat of an animal whose species disappeared at the end of the Pleistocene.

When prehistoric people were cooking camelid meat, the sea level was more than 100 metres below where it is today. González believes these people may have used the caves not only as rudimentary kitchens, but also as pathways to water sources. There is also strong evidence that dead bodies were placed in special caves far below the ground, perhaps to protect them from natural predators. But then a massive shift in global climate produced rapid rises in the sea level, as well as the intricately linked water table inland, and the burial sites and kitchens were all flooded – to remain unseen until cave divers discovered them millennia later.

Rolex funds research

Funds from the Rolex Award will allow González to field a team for at least another year of research; the group intends to focus on the Chan Hol cave, where a fourth skeleton has been discovered, but not yet removed or analysed. The more skeletons examined, González says, the





ABOVE: Using an underwater compass, González records the exact position of camel and horse fossils in a centoe. Their study will broaden the knowledge about ancient fauna, environment and climate. TOP RIGHT: Several dives and meticulous archaeological work were needed to properly excavate the bones found in cenotes, such as this skull dating from the Maya period. RIGHT: A skull from a cenote is recovered by González. Several hundred metres from the cave's entrance, human skeletons were found. The finding suggests that they were intentionally deposited at a time when the caves were dry, about 10,000 years ago

more comparisons can be made to similar human remains in other parts of the world —perhaps even putting more pieces into the puzzle of human history. Beyond that, González says he and his colleagues will focus on trying to understand the lives of these ancient people, especially how they used different caves for different purposes —clues that will lead researchers to move beyond the bones and toward a better understanding of prehistoric life.

These findings have greatly increased interest in the cenotes, leading González and his colleagues to work with residents of local villages to protect the rare treasures from damage and looting. They have also encouraged the villagers to speak out against the contamination of the underground waters by unrestrained tourist development along the so-called Mayan Riviera. Cenotes hold vital freshwater reserves, yet millions of litres of water are pumped from these aquifers every day, far exceeding their natural regeneration rate in some parts of the peninsula. In remote areas, cenotes are sometimes used as waste dumps that spread organic and chemical pollution.

As knowledge of the past increases, the challenge of getting in and out of the twist-

González and his team made several exhausting dives in Yucatan's cenotes in order to bring submerged archaeological remains to the surface to be studied and preserved

González and his team found human remains in Yucatan's cenotes that provide new insights into early human settlement of the Americas

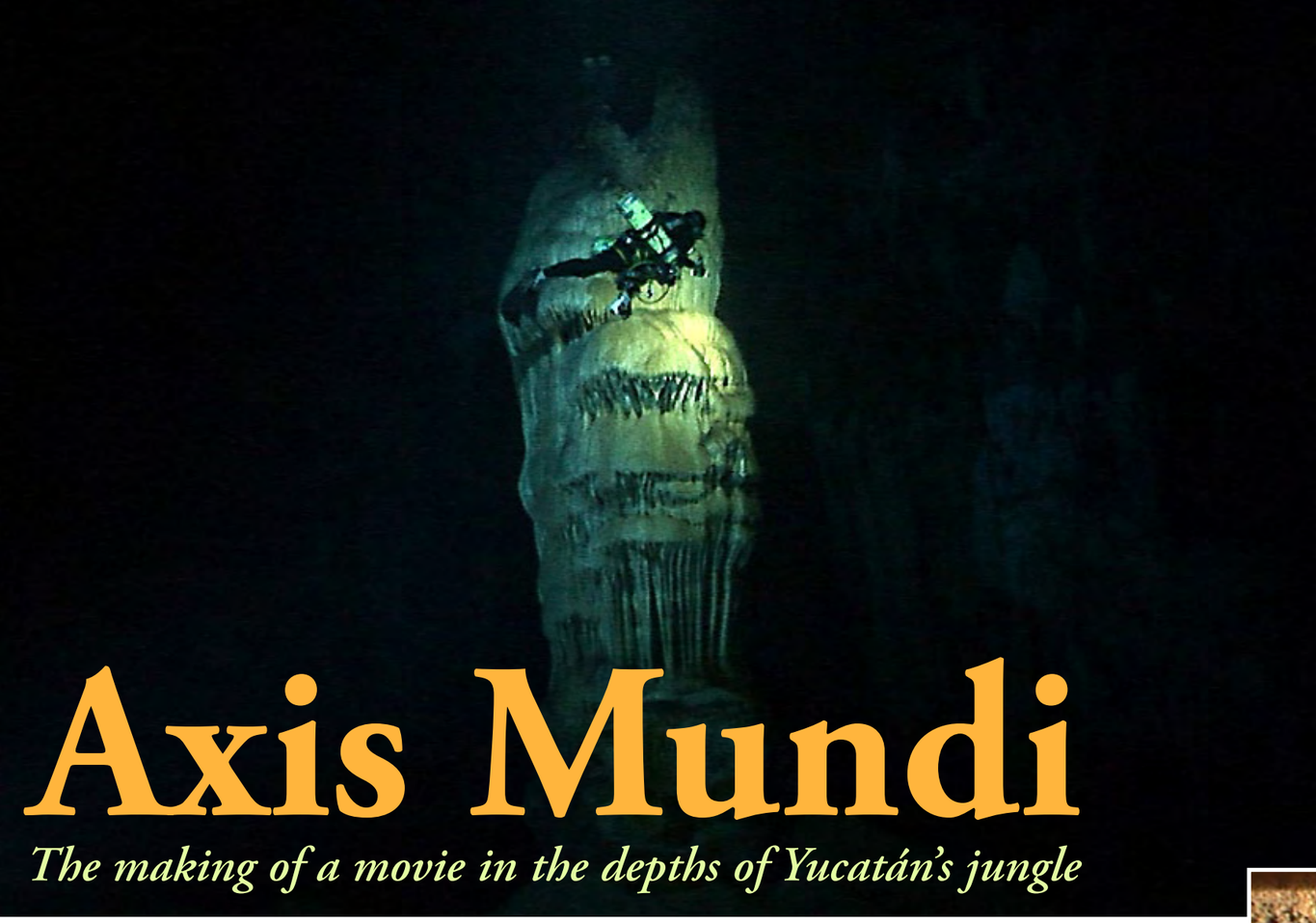
González and colleague Flor de Maria Curiel, in a field laboratory he established in the jungle, carry out a preliminary study of two human skulls brought out of a nearby cenote

BELOW: Alehandro Terrazas Mata (left) and Guillermo Acosta of Mexicio's National Autonomous University (UNAM), and González (centre) discuss three skulls found in Yucatan's cenotes

ing labyrinths remains a dangerous pursuit in the name of science and discovery. With complicated logistics and multiple equipment combinations to minimize the risks, the long and disorienting trips underwater remain physically and emotionally gruelling. A typical underwater expedition can take six hours, including the first hour to reach the cave of interest, an hour to carry out research, and then, given the need for decompression stops along the way, a four-hour return trip to the surface. Fortunately, the scientists are assisted with this aspect of their work by a small cadre of highly trained, professional divers whose knowledge of the systems is a precious resource.

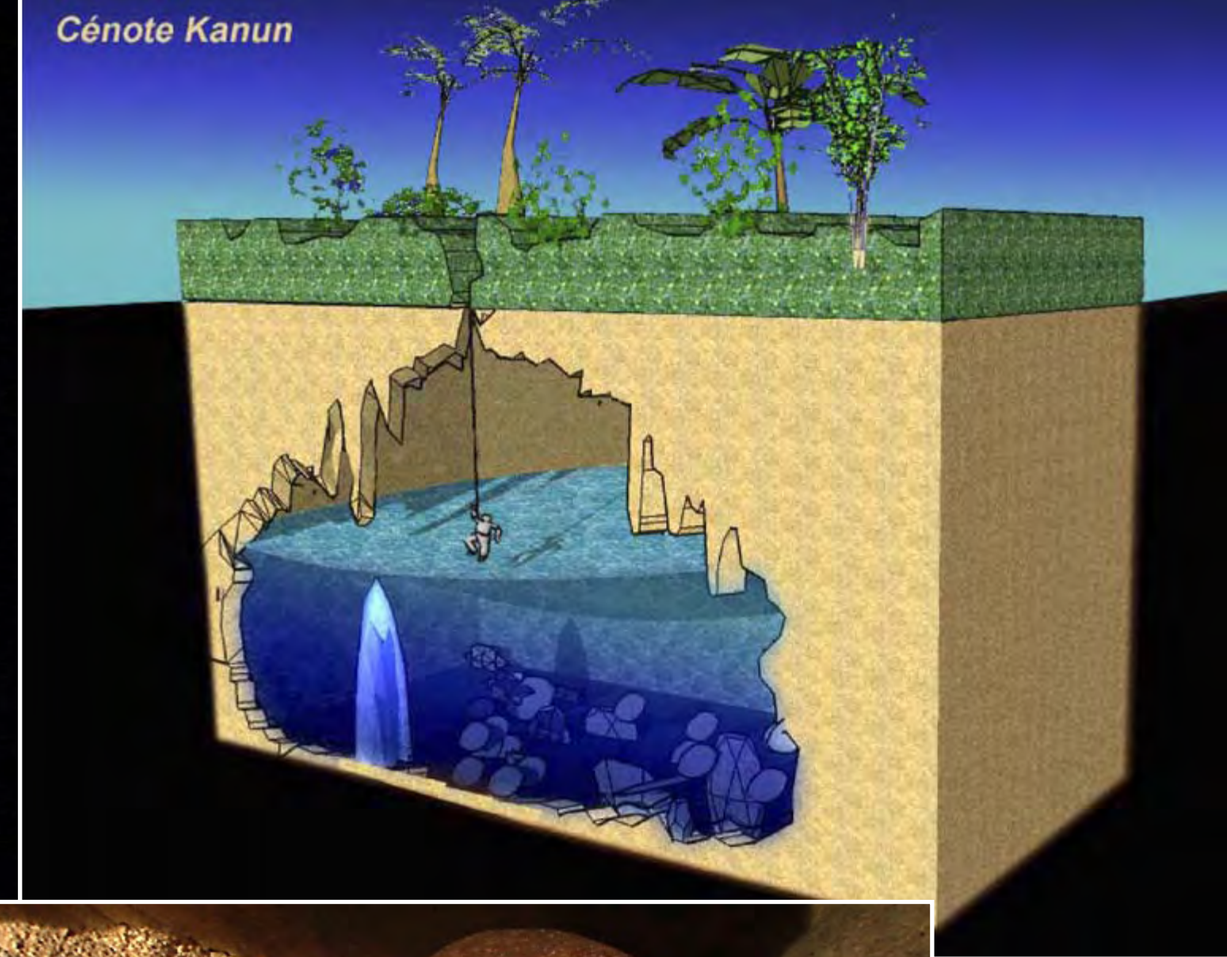
Many years of work still lies ahead for González in what, according to Prof. Wolfgang Stinnesbeck, specialist of Mexican geology and palaeontology at the University of Heidelberg, "is certainly one of the most fascinating and outstanding research projects in modern geosciences and has already delivered an impressive number of outstanding results". And it's a race against time given the Yucatán's burgeoning tourist development. Yet for González, the risks the divers take as they plunge into the watery windows on the past are worth the challenge.

"As an inhabitant of the Americas, I'm interested in knowing who these people were, where they came from, and when their first steps in the Americas occurred," he explains. "In these sites, we can find the archaeological contexts just about as they were left by the people of the Ice Age. It's a great treasure and it's my passion to get there and discover them, and be able to interpret them in order to share a new understanding of the history of humanity." ■



Axis Mundi

The making of a movie in the depths of Yucatán's jungle



CLOCKWISE FROM TOP LEFT: A diver confronts the giant stalactite of Karril; Cross-section of Cénote Kanun; Human skull found in a cenote

Text and photos by Nathalie Lasselin, director of *Axis Mundi*

The Yucatán peninsula is mostly known for its Riviera Maya and its all-inclusive package trips that allow tourists from colder climates an easy escape from their dreary winters. Cancun airport is the usual arrival point for these masses including those who have opted for one of the now several "Riviera Maya" packages that combine relaxing and diving on coral reefs with the opportunity to discover, or get introduced to, cave diving in the world famous sink holes known as the cenotes.

Those that leave the coast will often head towards Chichen Itza, with the famous Maya ruins. We are heading in the same direction as we set out on our Yucatán 2008 expedition, but in our case, we go right past Chichen Itza and head further inland to a tiny village named Homun, which is located in the very middle of the Yucatán jungle, a four hours' drive by car from Cancun.

Here, our hotel turns out to be a 400-year-old church where we could set up hammocks and rest protected from jungle life.

Before that, detailed logistics and preparation had us put in our luggage all that we might need during our journey. The trip groceries were acquired in Cancun.

The program lying ahead of us was the documentation of the cenotes, wells and caves in the region. For over ten years, our team leader, Curt Bowen, has been returning here, meticulously combing through the area and following trails, looking for new cenotes to explore. In addition to searching for new caves, this year's expedition was also about shooting a film *Extreme Diver*, a US-Canadian co-production

Go back 100 times to get the job done

between ADM and Pixnat.

The only way to discover new caves is to take new roads and follow the directions of the locals to any water source that may have not been explored before, and then, send in the first diver. Most cenotes are not big open spaces with high ceilings often depicted in photographs, but wells—mere holes in the ground, or other small orifices—which sometimes reveal niches full of artifacts.

Once on site, we checked if the cave had been explored before. It was a great help that known cenotes were now marked with their GPS coordinates, because without this, it would be impossible to keep track of every water-filled hole explored.

On every trip, we visit more than 60 holes. It's difficult to remember them all, especially as ravaging hurricanes and overgrowth can change their appearance from one year to the next.

If the cave turns out not to have been explored before, we assess the rappel depth that will need to be performed and get out the boxes with ropes, harnesses, helmets and diving equipment.

Every site needs to be analyzed in detail in respect to how we are going to secure ourselves. Not only do you have to be sure that the branches or stones that we use to secure ourselves are strong enough, but also one must check that there is no biting or stinging wildlife in the way. Despite this, our topside cameraman was stung by Popoche (a plant that causes skin reactions). But that goes with the job when one has to stand in all those places in order to shoot film.

Usually Enrique and Elmer, our local guides, would open up a passage with their machetes, and we would keep on the marked trail, or have our eyes wide open if we strayed off the trail.

If Popoche only causes an unpleasant tingling like poison ivy, it is nothing in comparison to what happens if you get too friendly with the Chechen tree. In 2006, a stranger got the brilliant idea of having his picture taken while embracing a Chechen tree. Immediately, he developed a cirrhosis skin rash.

Norma, a Mexican archeologist who relayed the story to us, saw the man again a year later, and his skin still had not regained its original color. However, nature is wise and an antidote is usually close by. The challenge is to recognise it and know how to use it.

Going down

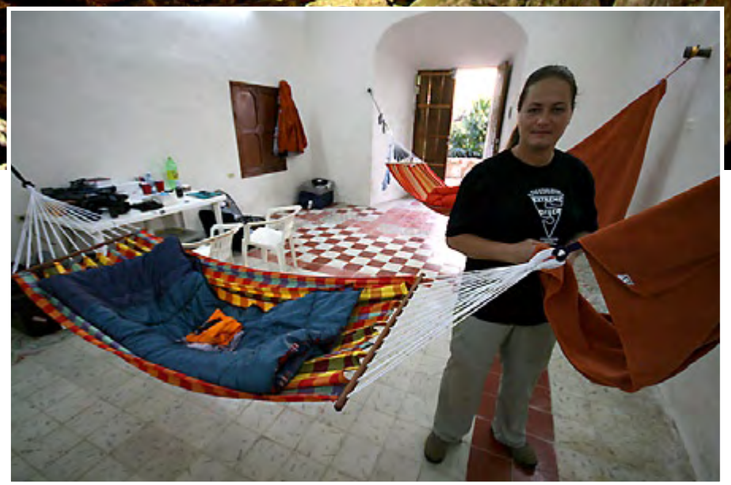
We were now set up close to the well, and the ropes were in place. Next, somebody went down to scout and report on the cave appearance, the water and the type of artifacts—if there were any—and also whether the cave warranted a more indepth exploration or not.

Different techniques were used for this first exploration. The first was called "power snorkelling", which is, in fact, the use of a sling tank that allows us to briefly visit the cave. If the water surface is in a dry cave, the explorer will check it while breath holding.

Brett Hemphill used this technique several times. We were filming and waiting for him on top of a rock. We could only hear him breathing, quickly hyperventilating before diving, and we were waiting for him to come up to hear his report.

Silent seconds went by. How long could he hold his breath? I had no idea, and as I could not see the water surface, I could do nothing but wait passively. When he finally emerged, his fast breathing concerned me. I asked him right away if everything was all right. He regained his composure and came climbing back up the rock. Obviously, something had happened.

The cave was really very small, and there was a restriction right after the entrance. He tried to go



Filming puts divers in lots of awkward places and positions; Lodging for the night in hammocks in a 1,000-year-old church; Local cultural site; The descent

Human bones and sometimes animal bones are found in cenotes

BELOW: Diver rappels down a tight well

through, but his climbing harness got stuck in the restriction. He was able to detangle himself, but the exploration report was clear. The cave was too—small no exploration was possible.

If Brett did not push for further exploration, I was not the one who would push the issue either. Brett is one of those people who would bring a shovel to open up a passage if necessary. He is an expert of *no mount* and small passages, and he is used to going close to his limits and sometimes beyond.

Karril and the giant stalactite

The challenge in this type of exploration is not always the diving as such. Given the limited resources available in this remote area, all dives had been conducted in sidemount, on air with 80 cubic feet aluminum tanks, which doesn't really meet the requirements for an hours' dive.

When I would go down to film, I was usually the first one in the water out of a team of four divers. Two divers were filmed, another diver took care of the lighting, and I carried the camera housing and additional lighting.

An unforgettable dive

When we arrived on the hacienda property where the cenote Karril is located, we stopped our vehicles on the side of the dirt trail. From there, we had to carry the equipment for roughly 700 meters to get to a hole in the ground, which was only one meter by 60 centimeters wide.

I slide into the hole, while looking out for the snakes that sometimes dwell there; it was a vertical descent of more than 15 meters before touching the water surface.

The walls are covered with hundreds stalactites of different sizes. The ceiling is full of bats.

Once we got into the water, feet first, the long dive began. First, we put our fins on and detached ourselves from the ropes. Then, we started 'the rope dance'— one tank, then another, a diver, then a tank, then another, and so on, until the whole team, the tanks, the lights, and the video housings were in place. This underwater choreography had been rehearsed many times on the surface.

We found ourselves in front of probably the biggest stalagmite in the Yucatán. It was impressive to stand in front of this marvel of nature. A little bit deeper, around 35 meters, we discovered a complete human skeleton lying on its side. Its position showed that the cause of death was not drowning, but that the body had been thrown into the water after death.

There are many human skeletons, as well as some from animals, in the cenotes, in addition to pottery. Some artifacts are clearly Mayan offerings, but that is not the general rule.

The darker a skeleton is stained, the older it is. Some of these skeletons may be more than 1,000 years old. Pottery has been dated to 250 to 900 BC. In Mexico, it is absolutely forbidden to move or collect any artifacts.

The database compiled by the team is recorded in an annual book with pictures, maps, reports of each explored cave, and the information is shared with government agencies like the INAH (Instituto Nacional de Antropologia e Hisotria).

After an hour of filming the majestic stalagmite and the nearby artifacts, it was time to get back to the surface and get the equipment and the divers out. When I was finally back on terra firma, four hours had gone by.

Water temperature was comfortable at 25°C and a 5 mm wetsuit offered optimal protection without interfering too much with movement on the rope.

It was time to put away all the equipment and to walk back to our vehicles. We kept the topside camera not far away from the hole, in order to be able to film the bats exiting at dusk.

Another long day of exploration had come to an end, and within the hour, we would be back in Homun. We rinsed our equipment and hung it to dry, and then we took cold showers.

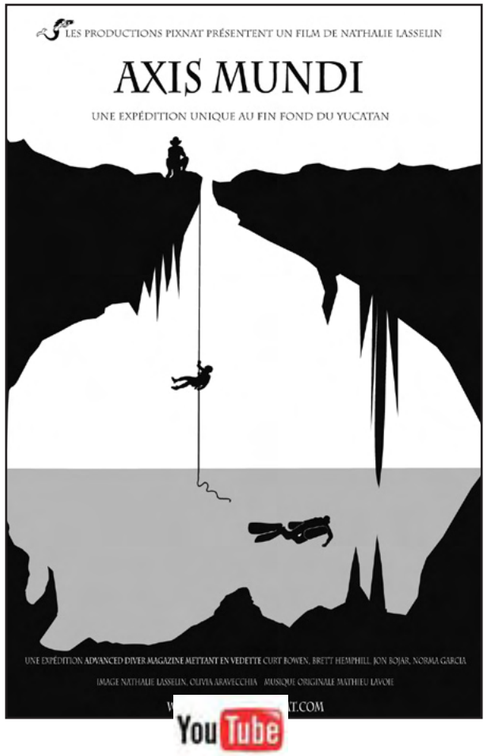
We had to use an anti-tick dog soap and inspect our bodies. The ticks are everywhere in the jungle, and every day, we had to get them off our skins.

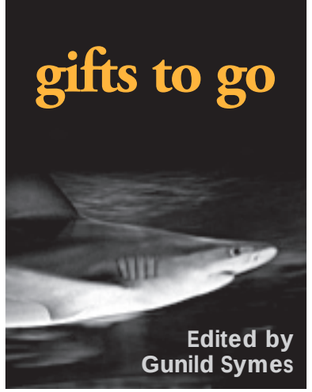
I was finally clean, and the dinner bell rang. Tonight, we would have rice and red beans—a real treat that we alternate with spaghetti.

The 2008 expedition ended with no accidents or illnesses. New cenotes were listed and documented. The highlights of this expedition were, without a doubt, the giant stalactite of Karril, the extraordinary meeting with the Mayan people, learning about their culture, and diving in an absolutely fascinating environment. ■

Click on YouTube button to see the trailer

Axis Mundi





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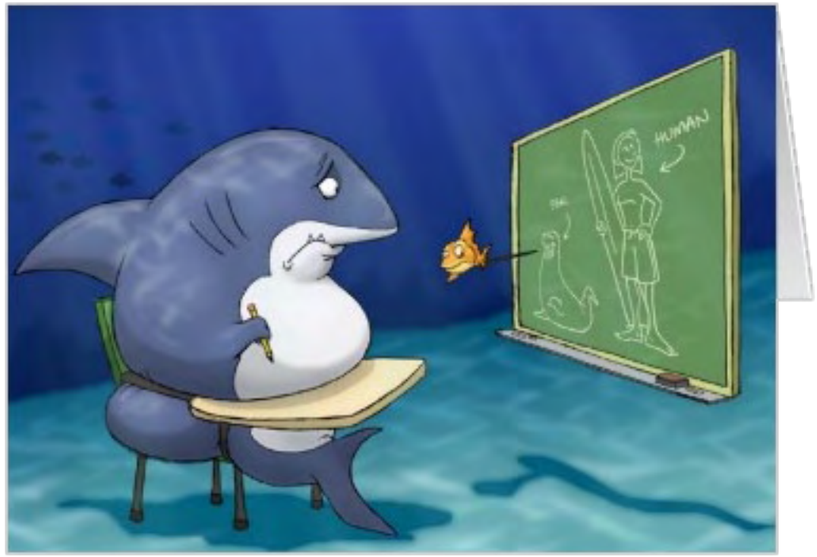

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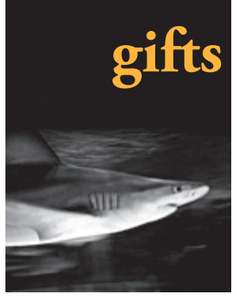
Is your inner shark confused? Cartoonist S.T. Lewis says, “Here’s a shark trying to figure out the difference between surfers and seals, so he won’t eat any more surfers by accident... Whenever a surfer is attacked by a shark, some shark expert claims that the shark just mistook him for a seal. How hard is it, sharks?” Find it on t-shirts and cards at his shop on **www.zazzle.com**



Tateossian Shark Tag

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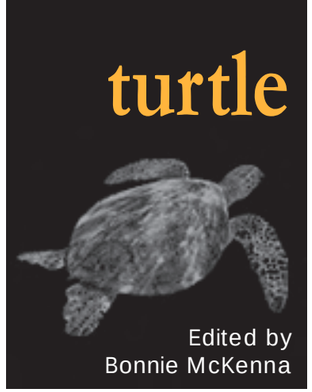
turtle tales



Edited by
Bonnie McKenna

First century trading routes centered on the Silk Road, circa 500 BCE - 500 CE

Trade Routes for Tortoiseshell

Prized since ancient times, the tortoiseshell trade has flourished across continents and across the seas. Since 1700, the Japanese have been famous for the world's best tortoiseshell or bekko artists.

Marydele Donnelly, director for Caribbean Conservation Corporation, reported that during the past 100 years, millions of hawksbills have been killed to supply the markets around the world with tortoiseshell. The wanton killing of the hawksbill turtle has had a devastating and enduring effect on the world's hawksbill populations.

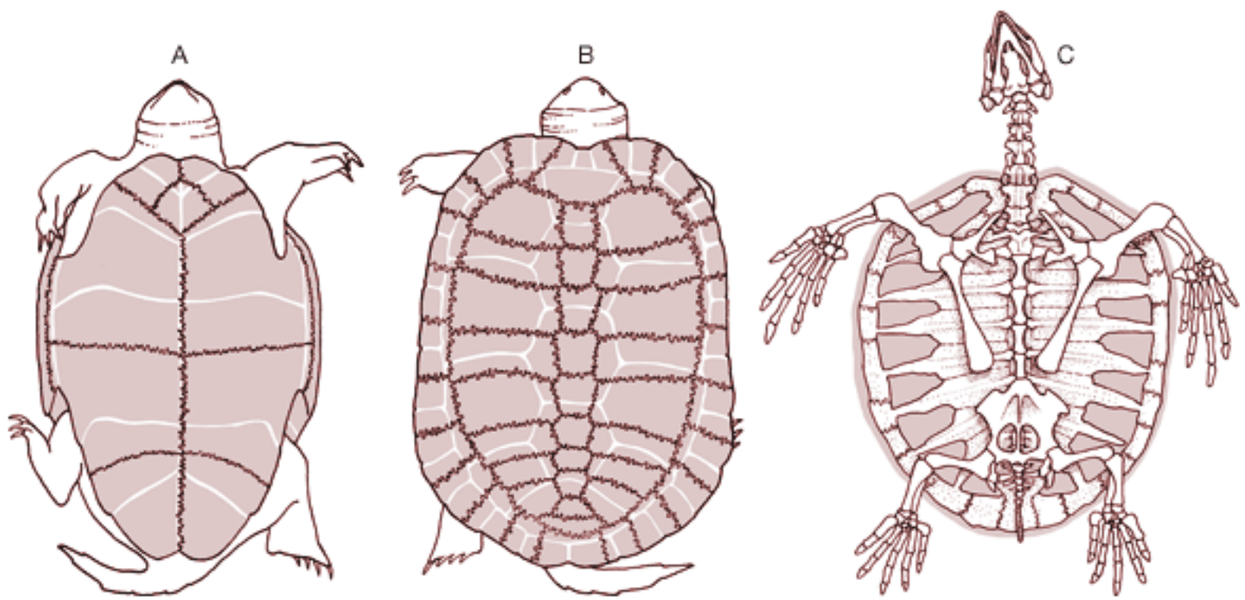
The largest market for bekko in the 20th century was Japan. From 1950 to 1992, Japan imported approximately two million hawksbills—more than 1.3 million large turtles and 575,000 stuffed juveniles.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) came into force in 1975. In 1977, it prohibited trade in tortoiseshell among the signatory nations. As trading nations ratified the convention, the volume of trade diminished.

Japan took an exception to the ban and did not stop trading for several more decades. By 1992, international pressure forced Japan to halt their trade in tortoiseshell. Japan continues to try to re-open the international tortoiseshell trade. In 2007, Japan announced that it would continue to fund the bekko industry for another five years.

Despite progress in reducing the trade in tortoiseshell, hawksbill populations have not stabilized nor begun to recover. ■

Turtle's shell formed from ribs inside the egg



ENCYCLOPEDIA BRITANICA

Japanese scientists from the Riken Center for Developmental Biology in Kobe, Japan, have discovered how the turtle's shell develops. The scientists studied and compared the development of soft-shelled Chinese turtles, chickens and mice. They observed a folding process that occurred only in the turtle, producing a disk-shaped thickening of the skin on the back that indicated the position of the shell. The ribs grew outward from the developing shell trapping the turtle's shoulder blades inside its rib cage. This developmental difference is unique among vertebrates whose shoulder blades are formed outside the rib cage. This finding challenges the traditional theory that the shell forms from small bony plates within the turtle's skin. The researchers also found that one stage in the embryonic development of the modern turtle resembles that of a 220-million-year-old fossil discovered in China last year. The 2008 finding in China is the oldest turtle fossil on record. ■

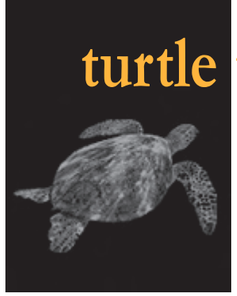
Turtle eggs still on the menu in Malaysia

The World Wildlife Foundation has launched a campaign to stop Malaysians from eating sea turtle eggs. WWF's five-month campaign aims to collect 40,000 signatures from Malaysians pledging to stop consuming the eggs and halt the trade in turtles and their parts. A spokesman said that some 10,000 leatherback turtles used to nest in northeastern Terengganu state, but this has now been reduced to less than ten a year. Authorities are now patrolling the beaches near hawksbill nesting sites in southern Malacca state after 4,000 eggs were stolen. Under Malaysian law, it is illegal to collect turtle eggs without a permit, but the demand for turtle eggs in Southeast Asia continues to drive the illegal trade. ■

Police in Vietnam free hundreds of sea turtles

Vietnamese police removed 849 turtles from a fish-farming cage from a man who was illegally raising them. The man bought the sea turtles from fishermen in the city of Nha Trang, raised them to maturity, and then sold them for their meat and shells.

International wildlife and trafficking organizations said it is illegal to raise or sell sea turtles in Vietnam, but the practice is not unheard of. ■



Kemp's ridley sea turtles nest count increases


USFWS

For the fourth consecutive year, the number of Kemp's ridley sea turtle nests increased along the coast of the state of Texas in the United States.

"There were 197 nests on the Texas coast—two more than last year. There was less on the upper Texas coast due to the hurricane (Ike in 2008) damaging the beaches, but the turtles went to other beaches," said Carole Allen, Gulf office director of the Sea Turtle Restoration Project.

The lower nesting figures on the upper Gulf Coast of Texas are due to storm erosion of the beaches changing the grade of the slope and the renourishment of many beaches along the Bolivar Peninsula. Studies show that renourishment hinders turtle nesting, but that it rebounds the following year.

Allen said, "We are awaiting release of the new government Recovery Plan for the Kemp's ridleys and hope that the Texas coast is declared critical habitat for this endangered sea turtle." ■

Acclimating captive Hawksbills

On the island of Nevis, in the Caribbean, Barbara Carr Whitman with the Under the Sea Sealife Education Center has been acclimating sea turtles prior to release into the sea since 2002.

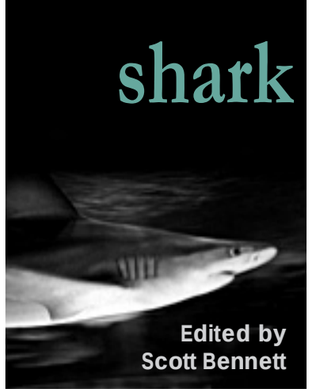
According to experts, methods of acclimation vary and have not been studied thoroughly, but it is believed that sea turtles raised in captivity do not have the innate skills necessary to thrive in the wild. To prepare the turtles for release, they are kept in a 2000 gallon aquarium allowing the turtles to swim while in captivity. The tank is populated with fish and invertebrates and made to resemble the wild as much as possible. When the turtles are between 16 and 18 months old, wearing a special harness, they are taken for swims in the sea to slowly acclimate to the wild.

Whitman believes that acclimation will reduce stress at the final release and boost the turtle's chance of survival. During the acclimation period the turtles increase their muscle strength and adapt to a world without walls, predators or a ready supply of food. ■

Tracking endangered sea turtles with barcoding

The American Museum of Natural History and the University of Canberra, among other organizations, demonstrated that barcoding can be applied to all seven sea turtles and provide insight into the genetic structure of this widely dispersed group of animals.

Barcoding items collected by wildlife management can provide information and tools to track international trade in wildlife. The barcode sequences from the study have been supplied to the Barcode of Life database and GenBank, so that the data are freely available. The potential for DNA barcoding is significant: trade in meat, eggs, leather, shell and bone means that the species identity or geographic origin will be easy to decipher assisting wildlife management in halting the trade in endangered species. ■



shark tales

Edited by Scott Bennett

World's First Shark Sanctuary in Pulau

During the recent United Nations meetings, the President of Palau, made a bold inititative: the creation of the world's first shark sanctuary within the territorial waters of his tiny Pacific nation. President Johnson Toribiong said his country wanted to provide "a sanctuary for sharks to live and reproduce unmolested in our 237,000 square miles of ocean". That is an area bigger in size than France. He urged other countries to follow suit and ban shark fishing in their waters.

"It is anomalous that Palau is experiencing economic difficulty while it sits in the middle of the richest waters in the world. We can no longer stand by while foreign vessels illicitly come to our waters to take our greatest resource, our tuna stocks, without regard to their conservation and without regard for adequate compensation to the island States which rely on this resource," President Toribiong concluded.

The diving industry has long championed protection of the world's shark populations. Palau is a South Pacific scuba diving hot-spot, and divers internationally applauded the President's anouncement. ■ SOURCE: AP

EDWIN MARCOW

WIKIPEDIA

Bull shark

'Swim with sharks' tours may become illegal on O`ahu

The Honolulu City Council gave preliminary approval today to a bill that would ban so-called "shark tours" from operating on O`ahu.

There are currently two shark tour companies on the island, Hawaii Shark Encounters and North Shore Shark Adventures. Both companies are based in Haleiwa and attract sharks by throwing bait into the water, then lowering customers into the ocean in cages covered in Plexiglas to see the sharks up-close.

State law already makes it illegal to operate shark tour boats within three miles of the shore, so tour operators are forced to go out into international waters. The bill before the City Council would make it illegal for to run "shark tour operations" defined as "the maintenance of an office, the collection of a fee or other financial consideration, the distribution, marketing, or advertising of tickets, or the conduct of any other business activity" related to shark tour boats on O`ahu.

Councilman Charles Djou, the bill's sponsor, asserts in the proposed ordinance that the existence of shark tours "raises public safety concerns for ocean users, is disrespectful of Hawaiian culture, alters the natural behavior and distribution of sharks, and may be disruptive of ocean ecology and the natural environment".

Djou's bill comes on the heels of a Maui County ordinance passed September 8, which makes shark tours illegal in Maui County (the islands of Maui, Moloka`i, and Lana`i). Maui's bill used identical language to the O`ahu bill in defining shark tour operations.

Despite the recent bans, a recent University of Hawai`i study found that shark tours "have a negligible effect on public safety" and do not draw sharks closer to shore. ■

SOURCE: EXAMINER.COM

Shark Diving—Do or Don't?

The proverbial shark diving debate is a can of worms that seems determined to remain open. Staunch supporters on either side seem utterly determined to dismiss the other's claims, yet like any issue, there are definitely pros and cons to each. Naysayers claim the practice promotes untaural behavior and poses a threat to the participants, while defendents claim it helps an increased awareness of the species' plight and aids in conservation. Rather than a purely black and white issue, it is an entirely grey area, with valid points to each. Feeding wild animals or altering their behaviour is far from a good thing, but I tend to believe increased awareness is starting to outweigh the cons. If the sharks are being protected and stringent safety is practiced, it is the lesser of two evils by far. Who is right? You be the judge.

—Scott Bennett