

# YAXCHEN AND OX BEL HA, QUINTANA ROO

Donna and Simon Richards

*It is 7:00 a.m. on a February morning in 2006. In a small fenced lot south of Tulum, a group of thirteen cave divers arrives in a succession of pickup trucks and vans, each loaded with up to a ton of diving equipment. Each diver has his own set of cave diving gear—double tanks, dry suits, regulators and lights—and all have brought as many additional tanks and electric diver propulsion vehicles (DPVs or scooters) as they own or can borrow. The divers have come from Mexico, the US, Italy, Canada, Spain, France, England, and Norway. Some of them have flown in especially for the diving this week, while others have relocated their families to Quintana Roo so that they can cave dive year-round. They have been meeting at this location for several weeks each year because it backs onto a cenote called Yaxchen. Yaxchen cenote is the main entrance to the Yaxchen underwater cave, a part of the Ox Bel Ha cave system, the second-longest longest cave in Mexico and the second-longest underwater cave in the world. To a cave diver, this is Mount Everest . . . before it was first summited.*

Until the 1970s, no one knew Ox Bel Ha or the other underwater caves here existed. The ancient Maya used the cenotes for water for drinking and

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This article was written in appear, in a Spanish translation by Mauricio Domenge, in a popular outdoor magazine. That version is, however, so far unpublished. The English text has been updated to reflect the recent connection that made Sistema Sac Actun the longest cave in Mexico. [See elsewhere in this issue.]

irrigation, but they also served a spiritual function; cenotes were believed to be direct links to the underworld. Friar Diego de Landa wrote in his *Account of the Things of the Yucatan* about the sacrifices at Chichén Itzá, “Into this well they were and still are accustomed to throw men alive as a sacrifice to the gods in times of drought; they held that they did not die, even though they were not seen again. They also threw in many other offerings of precious stones and things they valued greatly; so if there were gold in this country, this well would have received most of it, so devout were the Indians in this.”

More recently the cenotes have been used for snorkelling and other tourist activities. With the growth of tourist scuba diving on the reefs along the coast, it was only a matter of time until divers would turn to the cenotes when the ocean was too rough for diving. What they found shocked and then astonished them, for in some areas, the walls of the cenotes gave way to the entrances to underwater cave systems. Initially dark and foreboding, when the divers returned to explore the caves with lights rigged for underwater use and proper cave diving equipment, the mythical underworld of the Maya was revealed as an enchanting world of crystal-clear water and beautifully fragile stalactites and stalagmites. Word spread among cave divers in Florida and elsewhere, and within a few years a small number of experienced cave explorers were living in the region, instructing and guiding tourist reef divers by day and exploring the underwater caves by night and on weekends.

In fact, those modern-day divers were not the earliest explorers of the Maya underworld. That honor goes to Edward Thompson, an archaeologist

and the youngest American consul to Mexico. Thompson spent over forty years in the Yucatan, during which time he acquired the lost city of Chichén Itzá. Driven to prove that de Landa’s account was not fictitious, he undertook the first underwater cave-exploration project in the sacred cenote at Chichén Itzá. According to his book, he was told by his friends, “No person . . . can go down into the unknown depths of that great water pit and expect to come out alive. If you want to commit suicide, why not seek a less shocking way of doing it?”

After years of planning, in 1904 he prepared for the world’s first cave dive. Thompson and one of two Greek divers he had hired each donned a dry suit, a thirty-pound hard hat, a lead necklace, and iron-soled shoes. As Thompson took his first step on the ladder, one of the Maya workers left his place to shake hands with Thompson, his face echoing the same concern as the other natives. None expected him to return.

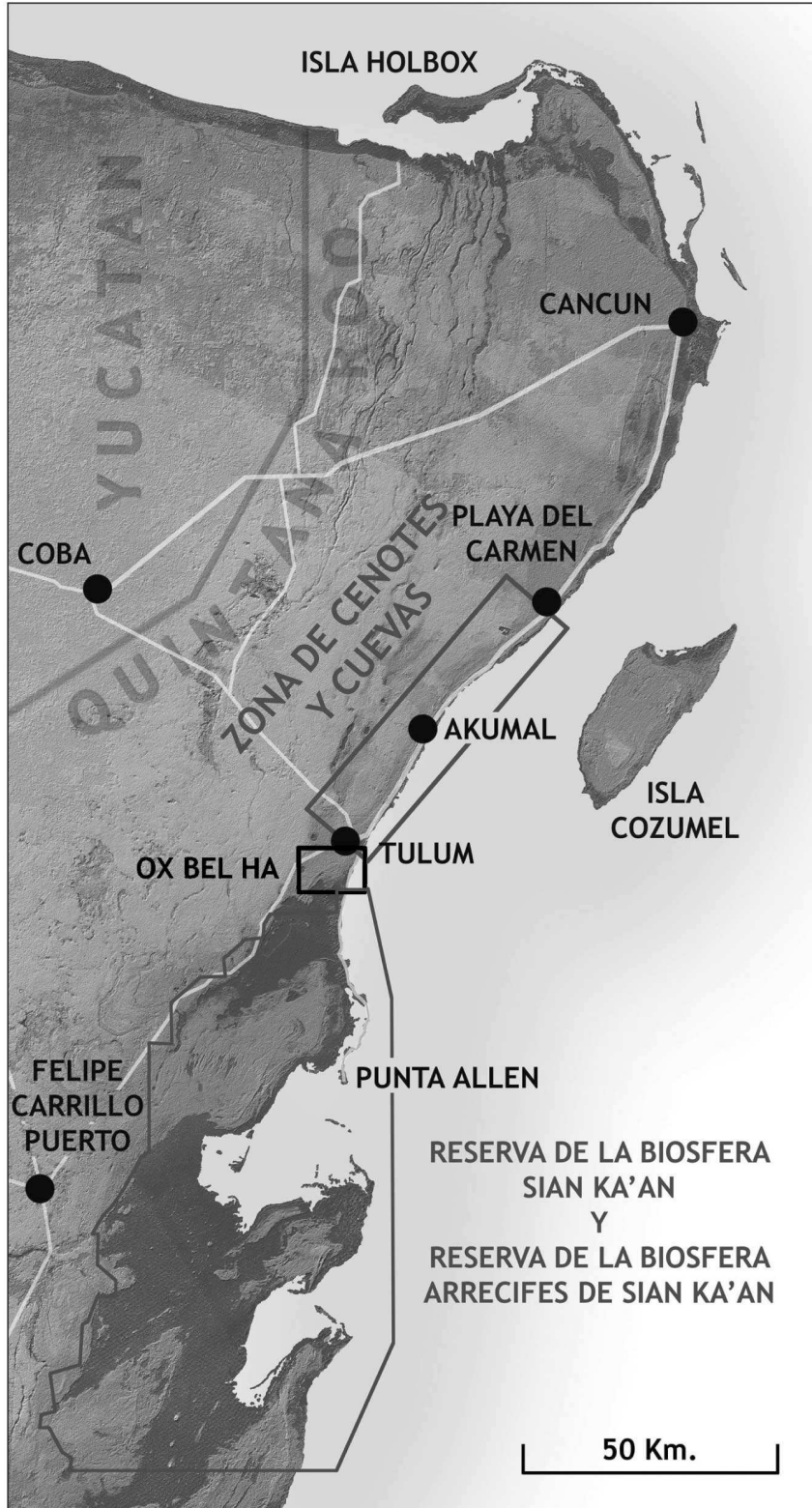
Although Thompson had some idea of the objects he would find because he had been dredging artefacts for several months, he had little idea of how dark the pit would be or how the mud bottom would render his specially made underwater light useless. His diving technique would not impress modern-day cave divers, who are taught to glide smoothly through the water, avoiding the bottom. As Thompson and his companion descended, the water quickly turned from yellow to pitch black. Because the water filtered into the cracks and loosed some of the blocks above their heads, stones would frequently drop into the water, and the divers had to take care to avoid injury from the displaced rocks and, most especially, not allow them to sever their air lines. The divers scrounged on the thick bottom,

creating plumes of silt and retrieving the objects the dredge couldn't gather.

Thompson accomplished his objective, proving that human sacrifices did occur among the ancient Maya. In spite of many health problems brought about

by living and exploring in a harsh environment for so many years, Thompson had the heart of a true explorer. More than forty years after he first stepped foot in the Yucatan, he penned, "I have squandered my substance in riotous

explorations and I am altogether satisfied. The reward of a labor of love lies in the performing of it, and I can look back upon a career as full of incident and adventure as any man has the right to expect."



The new generation of underwater-cave explorers that emerged in the 1970s and 80s had different objectives than Thompson. They were concerned less with retrieving ancient Maya objects in the cenotes and more with the underwater caves themselves. The first to arrive had learned the special cave-diving techniques in the underwater caves of Florida, which are not as extensive or as beautifully decorated with cave formations as the caves in Quintana Roo.

When divers first brought their specialized cave diving equipment to Quintana Roo some twenty-five years ago, many locals assumed that its purpose was to assist in harvesting black coral from the reefs offshore of Tulum and Akumal. However, when they were told that the objective was to explore inland cenotes, it was as if a dark cloud had descended. Some cautioned that there were serpents and spirits (the mysterious Chacs) in the caves; others believed there were jewels and gold hidden in the caves from the previous century's Caste Wars.

Soon the real treasure in Quintana Roo became known. By 1990, sophisticated maps of two caves had been published, while a third and fourth cave were being mapped to a high degree of detail. Over 60 kilometers of underwater passage had been explored in the Tulum area, and there remained no doubts that there was a whole network of caves under the jungle of Quintana Roo.

Although cave surveying techniques were well developed, there were few personal computers in Quintana Roo in the 70s and 80s, and so maps had to be drawn from survey data by hand. Caves were being found in excess of 10 kilometers in length, and the task of drawing the maps simply became too much for many explorers. There were dangers that survey data collected on exploration dives wouldn't be processed into maps and that when explorers left the area to pursue new challenges their survey data would go with them and be lost to others.



Claudia Höcher in the entrance to Cenote Chac Mool during a scooter dive. *Simon Richards.*

In 1990 two experienced cave explorers and surveyors, Lorie Conlin and Jim Coke, saw this problem and created the Quintana Roo Speleological Survey, which now acts as an archive for cave exploration in Quintana Roo and helps to produce maps from survey data collected by explorers. By 1995, the QRSS archive had grown to include over 180 kilometers of explored and surveyed cave passage. As of 2006, the QRSS database includes 636 kilometers of surveyed underwater caves. While preserving an account of the history of cave exploration in the area, it also acts as a central repository for information for scientists who are involved in legitimate research.

Persuading cave explorers to share their information with the QRSS was initially difficult. Everyone wanted to be the first to find and explore the longest caves, and so information on caves was often kept secret, and it was rare for competing groups of explorers to cooperate. In this context, the story of the exploration of Ox Bel Ha is remarkable. In 1996, a group of divers, comprising Sam Meacham, Bil Phillips, and two others, had made a short dive to check a cenote south of Tulum and found what appeared to be a massive cave system. Even though the cenote, Los Canales, was two hours into the jungle and the logistics of getting cave-

Fred Devos and Chris Le Maillot connect a new line onto an existing guideline in Sistema Sac Actun.

The arrow points to the exit.  
*Simon Richards.*

diving gear to this location was con- founding, they both dreamed of organizing a large-scale diving project there. Two years later, the pair returned to the area and dove another large cenote, named Esmeralda. It had taken the divers and four landowners several hours to reach Esmeralda with all the necessary cave-diving equipment, but the effort was worth it. They used all 550 meters of guideline they had brought with them, finding what appeared to be another large cave.

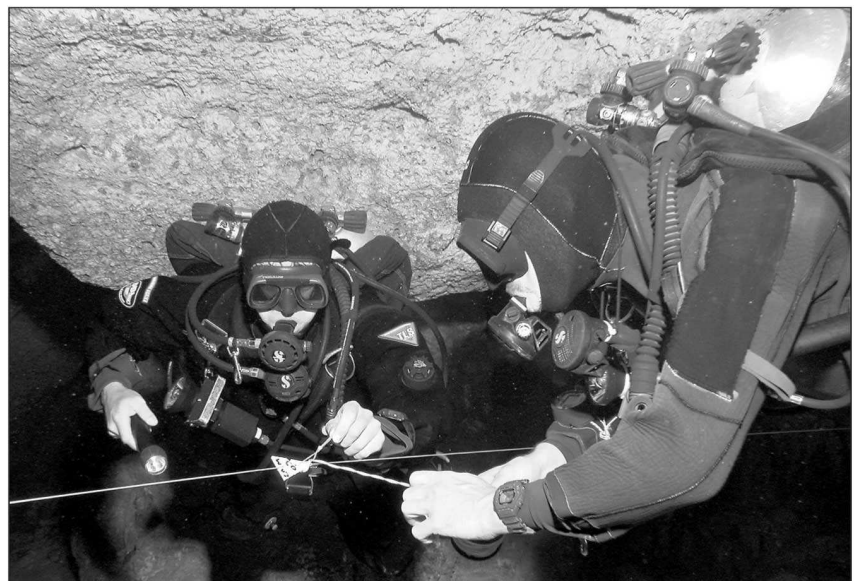
Meanwhile two divers, Bernd Birnbach and Christophe Le Maillot, were exploring another cenote south of Tulum, Cenote Del Mar, resurveying 1700 meters of lines laid by the initial explorers and exploring and surveying an additional 18 kilometers. Joined by Daniel Riordan, they made an important discovery: through three vents on

the downstream side, the system flowed directly into the sea.

The two groups knew of each other's activities, and when they compared notes, it became apparent that Los Canales, Esmeralda, and Del Mar were probably connected underground; they were probably different entrances to one enormous underwater cave system. Although the situation could have become intensely competitive, the teams of explorers instead formed an alliance to work jointly on the exploration.

In May 1998, the group was joined by divers Sabine Schnitger and Fred Devos, and a large project was launched at Cenote Esmeralda. Horses were used to carry the divers' compressor and other heavy equipment. The compressor enabled divers to refill their tanks at the dive site rather than transport them back through the jungle every evening. Over six weeks, connections into Los Canales and four other cenotes were made. From this first project the divers also learned much about exploration in remote places. They had already chosen the location for the next project, and on that and subsequent projects their bases would include camping facilities.

In May 1999, the alliance was formalized and given the name Grupo Exploración Ox Bel Ha, or GEO for short. By that time, the group had already





found the connection between cenotes Esmeralda and Del Mar, and they immediately launched a number of ambitious projects, cutting trails and establishing temporary camps that included generators for charging light and scooter batteries and compressors for filling tanks.

Despite some personnel changes resulting from differences in diving philosophies among its members, over the next three years GEO found and surveyed the underground connections between a number of caves and cenotes, and the combined cave system was named Ox Bel Ha, Mayan for Three Paths of Water. When the numbers were added, the divers realized that together they had found and explored the longest underwater cave in the world. [See Bil Phillips's article in *AMCS Activities Newsletter* 25, pages 40–46, for the history of exploration of Ox Bel Ha through 2001.]

One particularly challenging undertaking is known as the Jade Pearl Project, which took place in October/November 2003 and which involved founding GEO members Meacham and Phillips, joined by Steve Bogaerts, Andres Labarthe, and Roberto Chávez. Cenote Jade Pearl was named for its round shape and clear water and was located in a new exploration area, far off into the jungle. As with the other projects, trails were cut and a compressor was moved to the dive camp, but for Jade Pearl a helicopter was used to ferry four loads of dive equipment and provisions to the remote site (attracting some attention from local and federal officials). During two weeks, twenty-nine exploration dives were made, and over 15 kilometers of new passage was explored and surveyed. Ten new cenotes were connected into the system. [See "The Jade Pearl Exploration Project," by Sam Meacham, in *AMCS Activities Newsletter* 28, pages 63–77.]

Major camp projects such as these made diving in logistically challenging areas possible, and as a result an amazing 77,280 meters of Ox Bel Ha was surveyed by the GEO group.

Jim Coke of the QRSS considers the GEO alliance a major achievement.

Hervé Gorden during a photography dive in Sistema Sac Actun.  
*Simon Richards.*

Although it is relatively common for groups of dry cavers to combine efforts, cave diving groups had seldom, if ever, undertaken such cooperative ventures. This achievement would not have been possible without the help and support of a number of parties. Ejido José María Pino Suárez and Ejido Tulum provided access and assistance to the explorers, and non-profit organizations such as the Summit Foundation, The Nature Conservancy, the Steve Corey Memorial Fund, and Centro Investigador del Sistema Acuífero de Quintana Roo (CINDAQ) recognized the value of the exploration and supported it.

In January 1997, two American cave explorers, Kay and Gary Walten, were exploring caves in the Tulum area. Juan Tun, a member of Ejido Pino Suárez, showed them a number of the *ejido's* cenotes. One of them, a 160-meter-long cenote originally known as Escondido, had briefly been dived in 1986, but had since been forgotten.

Gary Walten described their initial impressions. "We first snorkelled the cenote in February 1997, swimming to the west tip of the open water pool, breath-holding to peer into the blackness. The void looked very promising. We did our first dive a day or two later and emptied our 400-meter-plus reel discovering another large cenote, and then swimming through that to find the upstream cave continuation. After that dive we were excited. We had found an extensive mangrove cave system that showed promise of going a long

distance, and we had high expectations." The Waltens named the cave Yaxchen, which is Mayan for Green Well.

Their instincts were correct, and they found themselves laying reel upon reel of line, extending the cave by thousands of meters. They launched a major project, Proyecto Yaxchen, which required what were some of the longest cave dives that had been done in Mexico or the world at that point. The significance of the project was apparent to people thousands of kilometers away. During 1997, the project qualified as an Explorers Club Project, joining the ranks of such historically notable expeditions as Hillary and Norgay's summit of Mount Everest and Aldrin and Armstrong's walk on the moon.

By the time their project ended in 2001, the Waltens had connected nine cenotes into Yaxchen and surveyed 18 kilometers of open-water and cave passage. Their longest dives were around 4 kilometers, with each diver using three scooters, the equivalent of eight standard scuba tanks of air, and a tank of pure oxygen for decompression. The Waltens also collected many hours of video footage to document the cave, and they involved a Canadian scientist, Samantha Smith, in obtaining water samples for analysis. Their accomplishments are even more impressive considering the limitations of the equipment they had been using a decade ago during their initial explorations. Since then, scooters have become significantly



Chris Le Maillot preparing for an exploration dive in Cenote Yaxchen.  
*Simon Richards.*



faster, and there have been advances with basic cave diving equipment, most notably in lighting.

The Waltens' explorations were blocked at the end of an enormous cave passage, the Río Grande Tunnel, by a large breakdown area where the surface rock had collapsed into the cave. They made several unsuccessful attempts to bypass this. Each attempt required three days of diving by the pair, a day to set up scooters and tanks halfway through the tunnel, then a push dive the next day during which they entered with fresh tanks and scooters and swapped equipment at the halfway point, and then a third day to retrieve the empty stage tanks and discharged stage scooters. Finally they reached a point where with the technology of the day they could go no farther.

When asked if they had any regrets about the end of their exploration, Gary Walten mentioned the obvious regret of not "walling-out" the system. But he also expressed the sentiments many cave-diving explorers feel, "the regret of compromising the purity and sanctity of an unexplored cave system, especially one as spectacular and unique as Yaxchen. Once 'discovered' by divers, a cave with easy access is seldom left undived and there is a sadness there for the explorers."

By 2003, two of the former GEO explorers, Riordan and Le Maillot, had formed an impressive team of divers that included Devos, Tulum resident Alejandro Álvarez, and Norwegian diver Per Thomsen. One of their aims was to find a route from Yaxchen up to Cenote Far, a large 120-by-70-meter cenote that could be seen on aerial photographs, but could not be reached on the ground through the dense mangroves above Yaxchen. To reach Cenote Far from underground, they would have to find a way round the breakdown that had blocked the Waltens at a distance of just over 4 kilometers from Cenote Yaxchen and then dive at least an additional 500 meters beyond that, in total farther than they or anyone else had dived in a cave in Mexico and close to the longest distance that had been dived

in any cave anywhere in the world.

With this objective, they began with a series of dives in Yaxchen in 2003. Their first task was to familiarize themselves with the cave. They were helped in this by the Waltens' providing their meticulous dive logs and survey data, which had been drawn into a map by Jim Coke. Alejandro Alvarez described his first impressions of diving Yaxchen: "The first thing that struck me was the sheer size of the cave. The first dive consisted of mesmerizing long traverses through cenotes bathed in sunlight, alternating with stretches of enormous cave passage with water ranging from an emerald green to almost opaque hydrogen-sulphide clouds through which one could sometimes see less than a meter. As we progressed farther through the system, the cave passages became longer and deeper, and it was clear that the cave was not going to end soon."

By September 2003, the team had reached their first objective, the end of the Waltens' main line in the Río Grande Tunnel. Far Cenote lay slightly to the west, and so the Riordan/Le Maillot team conducted a series of dives, each time backtracking a little farther from the end of the Río Grande Tunnel and looking for alternative passages to the west. Their efforts were frustrated, as every new passage they tried either ended in more breakdown or looped back to the Río Grande. Undeterred, they launched another project

in December 2003, and this time they made the breakthrough, connecting first to Cenote Ma'Kai and then to Cenote Far, a distance of 4.8 kilometers from their entry point at Cenote Yaxchen. They then followed the cave passage for another 700 meters, to a total distance of 5.5 kilometers, before breathing-gas limitations forced them to begin their exit. Satisfied they had achieved their initial objective, the team retired to plan its next move, exploration at unprecedented distances beyond Cenote Far and the connection with Ox Bel Ha.

But while the Riordan/Le Maillot team was pushing Yaxchen northwards towards Ox Bel Ha, two other cave divers were working on plans to push Ox Bel Ha south towards Yaxchen. One of the finds of the Jade Pearl project was another cave passage, heading off from Jade Pearl straight in the direction of the farthest upstream reaches of Yaxchen. The primary objective of the Jade Pearl project had been to try to find an underwater route from Ox Bel Ha to the Sian Ka'an Biosphere Reserve to the southwest, and so the passage towards Yaxchen had been left unexplored.

Two former GEO members, Phillips and Bogaerts, were determined to go back and see where this passage led. In contrast to the Yaxchen team, they used a cenote-hopping approach, working

coastward from Jade Pearl and moving their base camp every time they found a new cenote to enter from. The cave passage was initially so small that they used side-mounted tanks, rather than the back-mounted tanks more often used in the area. However, finally the cave opened up into large borehole passage with strong water flow that led them into Cenote Far, establishing the connection between Yaxchen and Ox Bel Ha.

Once the connection between Yaxchen and Ox Bel Ha had been found, Yaxchen became a victim of the particularly cruel convention for naming caves. When two caves are connected, they become a single cave with a single name, the name of whichever cave was the longer immediately before the connection. Although this area of Ox Bel Ha is still called Yaxchen for historical reasons, strictly the name for the entire interconnected system is Ox Bel Ha. (A number of small caves in the Yaxchen area have not been connected into the large cave yet, so they still retain independent names.)

The Sian Ka'an Biosphere Reserve was established in 1986 by presidential decree, and in 1987 became a UNESCO World Heritage Site. At approximately 1.3 million acres and extending about 120 kilometers along the coast, it is the largest protected area in Caribbean Mexico. In Mayan, Sian Ka'an means Where the Sky Is Born,

and much of the area is a large, open wetland habitat unlike anywhere else in Mexico, with exuberant tropical forests and rich coral reefs. It is home to over one hundred known species of mammals and over three hundred species of birds, and its wetlands provide nesting sites for wading birds and two endangered species of sea turtles. Approximately two thousand inhabitants live within the reserve, and almost forty thousand tourists a year visit it, but large areas are set aside purely for scientific research.

Since 1986, the non-governmental organization Amigos de Sian Ka'an has been helping to understand and conserve this resource and educate the public about it. Gonzalo Merediz Alonso, ASK's Executive Director, explains the role of water like this: "Water issues have become one of our main conservation interests. Forests help water recharge into the underground, and so we need to conserve the forests. Water flows through the underground, and so we need to understand and conserve this too. Water from the underground feeds coastal wetlands, and takes nutrients from these wetlands out onto the coral reef. The coral reef and the fishing and tourism it supports sustain a significant portion of the economy of Quintana Roo. Therefore, to do conservation work in Quintana Roo, we need to address the underground water world." Privately, he explains the situation more directly. "We need to prevent Sian

Ka'an from becoming the recipient of all of the contaminated water from Quintana Roo." As a result, ASK and The Nature Conservancy have been active in a number of recent projects, including helping to support the work of cave divers looking for the connection between Ox Bel Ha and Sian Ka'an.

It was the connection between Ox Bel Ha and Sian Ka'an that was the target of the divers assembled at Yaxchen cenote for the February 2006 project. The connection between Yaxchen and Ox Bel Ha had already been found, but no connection to Sian Ka'an had yet been discovered, and many areas of Ox Bel Ha remained to be explored.

There were two objectives for this week of diving in Yaxchen. One was to push an area of cave to the north that appears to be heading towards another connection with Ox Bel Ha. It would be useful to establish a second connection; furthermore this area of the cave is simply stunning, large passages up to 40 meters wide, clear water, and strong currents. The second objective was to explore some passages heading south from Yaxchen that are only a couple of kilometers from the *lagunas* of Sian Ka'an and seem to be heading directly towards some known cenotes in Sian Ka'an. But the project had another line of attack on the elusive Sian Ka'an connection. With help from governmental and non-governmental authorities and financial support from The Nature Conservancy, they had obtained permits to explore from within Sian Ka'an itself. One team would be walking the dry land between Sian Ka'an and Yaxchen with GPS equipment, looking for cenotes and other signs of caves, and a second team would be diving from the cenotes inside the Sian Ka'an Biosphere Reserve. Hopes were high that the week's diving would yield a connection between the world's longest underwater cave system and one of Mexico's largest protected nature reserves. [See the article "Underwater Caves of Sian Ka'an" elsewhere in this issue.]

One of the reasons behind this increase in exploration and scientific activity is the issues raised by the explosive growth in and around the village

Cenote Yaxchen. *Simon Richards.*





Alejandro Álvarez in Yaxchen.  
Simon Richards.

of Tulum, just to the north of Sian Ka'an and Ox Bel Ha. The Tulum development plans include a twenty- to forty-fold increase in the resident population over the next twenty years. Under Mexican law, the development plan must take into account the impact on the environment, and so it must contain a hydrological study. But the cave networks dominate the hydrology of the area, and this hydrological assessment will pose challenges beyond the scope of perhaps any other hydrological assessment ever undertaken in the world. Within the footprint of the expanded city of Tulum lies Ox Bel Ha in the south, which is the second-longest underwater cave system in the world with 147 kilometers of explored passage, while in the north is Sistema Sac Actun, with 154 kilometers of explored underwater passages, making it the longest underwater cave in the world. More than sixty other underwater caves are also being actively explored in the area, including Sistema Dos Ojos (57 kilometers), the third-longest underwater systems in the world.

The challenge is more than just knowing where the caves are. A recent study by Dr. Patricia A. Beddows, a hydrologist at McMaster University in Canada working in collaboration with researchers at the National Autonomous University of Mexico, has shown that the average fresh-water outflow at the coastal spring of Xel Ha just north of Tulum is about 7.3 cubic meters per second (a cubic meter is equivalent to a metric ton), or about 230 million cubic meters per year. A land area of 175 square kilometers would be required to



collect the rainfall necessary for this outflow. However, some rainwater is always lost to evaporation and transpiration by the vegetation, and so the catchment area may be over 1000 square kilometers. Nobody knows where this catchment area lies—how far inland and up or down the coast the water for Xel Ha is coming from. Xel Ha is not even a particularly big cave, and it is only one of many large coastal springs along the coastline. The total outflow from Ox Bel Ha has not even been studied, and its catchment area remains a greater unknown.

How can the town planners of Tulum produce an assessment of the environmental impact without a hydrological study that covers much of the peninsula? The information on which to base such a study simply doesn't exist, and the increase in demand on water resources will not slow down while it is

collected. Organizations such as Amigos de Sian Ka'an have recognized this, and they are working with national and international scientists on a broad regional study. The cave divers are also recognizing that their work is essential, and they are increasingly making their survey data available to municipal planners, organizations such as Amigos de Sian Ka'an, and resident and visiting scientists.

When cave divers began exploring the Three Paths of Water, the Ox Bel Ha system, they had no idea they might be playing a key role in the overall understanding of the region's water supply. They had no idea they might be in a position to assist conservation groups, scientific researchers, or towns such as Tulum. This is slowly changing, as explorers have realized that there are larger issues at stake.

### Yaxchen y Ox Bel Ha

Este artículo, originalmente escrito para una revista de actividades al aire libre, describe la exploración de las cuevas subacuáticas de Ox Bel Ha y Yaxchen en Quintana Roo. Las dos cuevas fueron conectadas y el resultante Sistema Ox Bel Ha se convirtió en ese entonces en la cueva más larga de México, con 147 kilómetros (actualmente es la segunda en longitud en el país). Partes del sistema están cercanas a la Reserva de la Biósfera de Sian Ka'an, y el crecimiento futuro de la ciudad de Tulum amenaza la calidad del agua en las cuevas y en la reserva.