



## 2004 MATE Center/MTS ROV Committee ROV Competition for High School & College Students

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### *The Adventure of Mystery Reef*

by Harry Bohm and Vickie Jensen

*"The greatest adventure is life itself!" – Bertrand Piccard*



#### **0545 Hours - June 11, 1942 - Position: DM4388 Just off the northern shore of Cuba**

Korvetten-kapitan Wolf Henne stood on the bridge of his surfaced U-boat anxiously scanning the sky for American air patrols. He didn't have to remind his lookouts that all their lives depended on utmost vigilance. Normally he would have been racing away from the area where he had sunk an American tanker only six short hours ago; instead the sub was wallowing on the surface like some whale basking in the ruddy glow of the rising sun. He was here under special orders from Berlin, sent in reply to his routine coded radio action report. Usually U-boat commanders were allowed to choose their next operations area, but this time Henne was to rendezvous with a German secret agent and take on a special cargo vital to the German war effort. That agent had finally arrived in a stolen fishing boat. On its aft deck were thirteen small metal barrels, no doubt the "special cargo." It had taken the rest of the night to carefully transfer them from the tossing boat deck to the sub's forward hatch and into the torpedo room.

Finally, it was done. Kapitan Henne turned his attention to a large, blond crewman in coveralls following the last barrel down the hatch. Now they could get out of here. He ordered the fishing boat cut away and the U-boat made ready for diving. Suddenly one of the lookouts cried out, "Aircraft! Aircraft!"

Henne yelled into the open conning tower hatch, "Alarrmm, Alarrmm, emergency dive!"

The lookouts careened below as the commander took a last glance aft. An American B-18 bomber! It had come right out of the rising sun, a classic textbook bombing tactic. He dropped down the hatch, secured it and made his way to the control room. He scanned the sub's instruments, fixing on the depth gauge. The conning tower was just under the surface now but leaving a nice broad wake in this blue sea, an easy target for the bomber. Gripping the periscope he braced himself for the fatal explosion that would come at any second. The bitter taste of bile rose up in his throat. Fear!

Kapitan Henne swallowed. He could not afford the luxury of fright. Instead he breathed deeply, closed his eyes and concentrated on devising a plan of escape. As he worked out his options, the fear dissolved and time seemed to slow down. This was the mental state a kapitan needed when in battle. He also felt the tense glances from men at their battle stations, assessing this new "untried" commander for any sign of weakness. But Henne was calm and steady. He even grinned as he glanced at his watch. One minute had passed with no splashes and no explosions. Some malfunction on the aircraft no doubt prevented

the depth bombs from deploying. Luck was with them, but he couldn't assume the pilot would not come around for another attack. The depth sounder showed the U-boat was heading into a deep channel of water.

"Helm, hard right rudder! Chief, take her down to 110 meters." The U-boat silently slipped down to seek refuge in the dark depths.

Two long minutes later the silent crew heard the splashes... one, two, three and four. Then seconds later, Wham! Wham! Wham! Wham! The submarine shuddered and creaked; water shot out of busted pipes and the glass on the depth gauge shattered. The lights dimmed then went out as the main electrical breakers blew. An acrid smoke filled the hot, damp control room. Then emergency battle lamps came on and crew called in damage reports: minor damage to the batteries, some leaks in the forward torpedo room and a couple of stunned seamen, but the U-boat and her crew were still alive and operational. The charges had detonated while still shallow. The depths had saved them from annihilation, this time. Now it was time to make a run for it.

***2345 Hours - June 11, 1942. Position: DM4312***

In the privacy of the tiny space called a cabin, Kapitan Henne sat at a diminutive desk and slammed his fist in anger. That spy had put all of their lives in jeopardy! Certainly by now the whole of the American anti-submarine forces based in Key West, Florida, would be out searching for them. It would be difficult if not impossible to avoid detection. And soon he would have to radio Berlin for orders. More risk. The Americans might be able to triangulate on his signal and converge on the sub with their aircraft and warships. He pondered his options and considered a gamble. By keeping close to the shoals he might just be able to sneak around any dragnet. The danger was running his U-boat aground on an uncharted reef.

Henne glanced at the commemorative brass bell that hung over his desk, a gift from Admiral Doenitz, engraved with the U-boat's name and a short inscription. Hanging beside it was a framed color photograph of a tropical beach with palm trees and azure clear waters. Henne's fantasy was to settle down on such a place and live out his days in peace. He sighed and pulled his war diary from a small locked box over his writing desk. He unwrapped the oilcloth pouch that gave some protection from moisture. As he began his entry, a bead of sweat dripped from his forehead and dropped onto the page. The freshly inked words began to deform and blur. He pulled a stained handkerchief from his sweat-soaked shirt and dabbed at the paper. Despite the protective oilcloth, the pages of his diary were spongy with dampness. Nothing ever stayed dry in this underwater steel "pipe." The air was stale and odorous. Condensation dripped everywhere. Mold grew ubiquitously, on the clothes, in the food and on the body. It was the lot of the submariner, he knew, a life you either loved or hated. Of more concern was the seawater that found its way inside his battered U-boat through the rivets and welds that had been cracked by yesterday's aircraft attack. Taking a swig of apple juice, Henne wiped his forehead and continued his journal entry.

## **War Diary**

**2345 Hours - June 11, 1942. Position: DM4312**

*Course 025. Speed 18 knots. Surfaced and running on diesels. The damaged batteries have been disconnected, the leaks slowed in the forward compartment. Now we are flying and putting the Cuban coast behind us. So far no sight of enemy patrols. Curse these clear tropical waters with no place for a U-boat to hide. Give me a cold dark sea where I can slither away from these American aircraft patrols. So far we have been lucky, but now the hunter is the hunted. In war fortunes can change so quickly.*

*This is my first command, my first war patrol and what luck to get a brand new boat. She is fast and I love her. What a change from the small "canoes" I trained in at submarine command school. I love being under the sea, although at times I long for a window. I know it is foolish, but I think of the wonders we must pass while blindly traveling under the waves. When this war is over perhaps I will study marine engineering and build such a boat with windows.*

*Although I can never let on to anyone, I think I am not a good soldier. I care too much for the lives of my crew and even the sailors in the ships we hunt. War is not a game to get the highest score, sink the most tonnage or win the most medals. It is an insane horror no matter what the cause or ideal. Our boat is wonderful but it is also a weapon that brings suffering. And now we also carry something I fear is even more frightening than our torpedoes. I can only hope this mysterious cargo is a few barrels of well-aged Cuban liquor for a high official in Berlin, but I suspect something sinister, perhaps a deadly chemical compound. Whatever it is, I am well aware that storing those barrels in the cramped torpedo compartment prevents us from loading torpedoes quickly. The chief is having a fit. As a result, I have ordered all the forward tubes loaded. He and I both know it is not a safe practice to have the torpedoes in the tubes, ready to fire--if an accidental arming of the "fish" occurs it will be disastrous for us all. But what choice do we have?*

Henne suddenly stopped writing, sensing that he was no longer alone. He wondered who dared to enter without knocking and turned to see the secret agent's massive frame filling the tiny space of the commander's cabin. The two men locked eyes as the German giant arrogantly tossed a folded document on top of Henne's war diary. Taking his eyes off the intruder, the kapitan picked up the paper, unfolded and read it. The "request," as it was politely worded, ordered the U-boat to proceed to one of the islands in the Florida Keys. There the agent would disembark with his barrels under cover of darkness. Henne began to visualize the actions his sub would have to undertake to make this work: elude pursuers, cross the Florida Straits, scrape the keel over fringed reefs, surface and offload this agent and his evil cargo to a waiting boat, all undetected. Impossible! It was suicide.

Doubt registered on the commander's face. The agent's steel blue eyes locked on Henne; he raised a small but wicked dagger, twisting the blade so it caught the overhead light. He tilted the blade so it pointed directly at the sub commander. Henne anticipated the feel of cold steel slipping between his ribs and his breath caught. Then the agent lowered the knife and began to clean his fingernails. Message received and understood. Agent or not, Henne was angered by the man's impudence, but his resolve crumbled when he looked down at the signature on the document. This giant of a man answered only to the highest

authority in the Reich. Not even Doenitz could countermand these orders. Turning his back to the agent, Henne reached for the intercom and ordered the navigator in the control room to set a new course. By the time he finished speaking, the man had vanished from his cabin.

### ***War Diary***

#### ***1145 Hours - June 12, 1942. Position: DM4323***

*Periscope depth. Speed 6 knots. Course 010 degrees transiting the Florida Straits to our spy's little island hideaway. I only hope we can make it undetected through the day. Most of the boat's damage has been repaired, except for that persistent leak forward. At least we can keep up with it as long as we stay at periscope depth. Going deeper forces water in faster than the pumps can handle.*

*No sign of enemy patrols. I am betting they have ranged ahead of us, sure that we are steaming for Sand Key Light to make a break for the open Atlantic. Little do they realize we are heading right to their doorstep, the western Florida Keys. Unrealistically, I hope they have given up and gone home.*

*The waters we now transit has often been called the "sea devils' playground or the "Devil's Triangle." There are legends of ships vanishing without a trace. I have heard stories of huge vortexes, of flames from the sea called devil's light, of foul smelling mists and specters standing watch on ghost ships. I wonder if even our U-boats could survive an encounter with such a maelstrom? I thought I was past superstition, but the longer I am at sea, the stronger my belief in such things gets. Right now I have two very real devils to worry about: our secret agent and American warships with their depth charges.*

*I will have to surface soon. The damage done to our batteries has reduced the time we can stay submerged. My head hurts and breathing is labored--all signs of foul air. We must ventilate the boat.*

Henne closed his journal, wrapped it in the oilcloth, stowed it above his desk and reverently touched the photo of the beach. Then he headed for the control room, turning his cap so the brim faced backwards. "Up periscope," he commanded. With one fluid motion he pulled down the scope handles and put his eye to the lens. When the periscope mast broke the surface he rotated it to scan the horizon for ships and aircraft. He noticed a mist in the distance, thinking that it could be a place to hide his boat. On the other hand it could also conceal an enemy ship. He hesitated briefly, then gave the order. "Surface!"

#### ***1201 Hours - June 12, 1942. Aboard the USCGC *Thetis* (approximately 30 nautical miles southwest of Key West, Florida.)***

*"Skipper, I think I've got a contact," said the radar operator. "Six miles, bearing 255 degrees."*

Lieutenant Nelson McCormick strode over to the radarscope. The lookouts on deck hadn't spotted anything except a mist in the direction of this contact. It might just be the

U-boat was hiding there. McCormick had nothing to lose if it was just a fishing boat; he could always break off the attack at the last minute. But a U-boat would have a hard time shaking him if caught on the surface.

“Battle stations, flank speed, pull the safeties on the depth charge rack and set detonators for 200 feet.”

The crew aboard *Thetis* worked calmly and quickly. McCormick had drilled them endlessly for just this moment. He reveled in the way his cutter surged through the calm seas at fourteen knots towards the mist and their quarry. His heart began to race as he concentrated on chasing down an enemy. He had learned the hard way never to underestimate a U-boat commander and he suspected the one who had taken out the tanker would be no exception. But if the radar contact was a sub on the surface, the vessel must be damaged; German subs rarely surfaced in broad daylight. It could also be a trap, he reminded himself. “Is the target still there?”

“Yes sir, it hasn’t changed course or speed.” the radar man confirmed.

Good, thought McCormick, if they still don’t know about our radar sets we just might get this one.

#### **1218 Hours - June 12, 1942. Position: DM4331**

“Destroyer...!!”

Henne started at the lookout’s words. Only five minutes more and he could have been hidden in the mist. He knew that the boat bearing down on them was too small to be a destroyer. No matter it was just as dangerous. He had to get his sub down. He closed the hatch just as the cutter fired its forward gun. The shell whizzed over the conning tower splashing harmlessly ahead of the plunging U-boat.

Henne ordered the chief to level out at 20 meters. He stared at the only primitive chart he had of these waters. How could he know for sure that there was enough deep water ahead for his boat? He glanced at the depth gauge that showed 60 meters more water below his present depth. His concentration was disrupted by the sound of the depth charges. There were seven explosions, all of them deep but strangely far away. The warship had badly misjudged the sub’s position and fired too early! Henne quickly made his decision to go deeper.

“Hard left rudder, take her down to 70 meters, chief.”

The sub began her forward dive when suddenly there was a tremendous crash! The U-boat shuddered, her crew were flung around the control room. Henne banged into the periscope, badly cutting his forehead. He wiped blood out of his eyes, straining to figure out what had happened. He knew it wasn’t the explosion they had feared. No, the sub had hit something hard and come to a complete stop. Lights blinked on and off. Smoke rose from the bilges and the smell of acid leaking from cracked battery cells stung the nostrils. Henne saw that the depth gauge read 41 meters. They must have hit an uncharted reef!

The kapitan listened as damage reports began to come in: the forward torpedo room was taking on water rapidly, the batteries were shorted, causing fires in the wiring, and the outer doors of the forward torpedoes were damaged, flooding all the tubes. Fortunately there was still enough high-pressure air to blow the ballast tanks. The sonar operator reported propeller noises getting louder. The sub commander realized that his boat was out of the fight. There were few options left; he made up his mind to surface and surrender.

Henne was about to give the order to blow all ballast and abandon ship when he was grabbed from behind and spun around violently. He stared into the cold eyes of the secret agent. “You can not and will not surrender, do you understand? My cargo must not fall into the hands of the enemy.”

The secret agent tightened his iron grip on the commander. Then suddenly the giant slumped forward and hit the deck. The chief engineer stood grim faced over the agent, a pipe wrench in his hand.

Henne nodded his thanks. “Put him in the forward compartment with his precious barrels until we surface. Then if we survive, we will let the Americans deal with him.”

The chief and a crewman dragged the agent to the forward bulkhead watertight door. Opening the door, they shoved his giant body into the abandoned compartment and secured the door as they left. Inside that compartment, seawater already lapped up to the deck plates and streams of water from a broken valve shot into space. The agent stirred and opened his eyes. He felt the swollen lump on his head, then slowly regained his feet. He stared at the barrels stowed between the torpedo racks. Some had become dislodged in the collision and were rolling around on the deck. He was about to fail in this mission and he had never failed before. The secret in those barrels must not fall into enemy hands. Reaching inside his shirt, he pulled out a small package of explosives. Then he moved to a torpedo tube door and tied the explosives to the ratcheting handle that opened the inner door. Then he set a detonator and timer. He knew that when the inner torpedo door blew open a flood of water would fill the submarine, preventing it from surfacing; and as that mass of water rushed by the torpedo’s propeller, it would start it spinning—an action that would arm the warhead. That subsequent explosion would destroy the barrels. At least this way he would not fail his mission. He sat back down, calmly waiting for the end.

“Blow all ballast! Prepare to abandon ship!” The U-boat commander gave the orders, then quickly stepped into his cabin. He gathered all the sub’s operational papers, codebooks, and the top-secret Enigma coding machine, hurriedly placing them in a weighted bag. In the confusion he almost forgot about his diary. He grabbed the war journal and stuffed it into a flapped pocket on his life vest. His plan was to be the first man on deck, toss the weighted bag overboard, then try and raise a flag of surrender. If he could at least get the white flag up, he might be able to save the lives of his men. Henne knew there was little hope that he would survive the action. The Americans would rake the submarine with machine gun fire as soon as they saw the conning tower break the waves.

“Bridge clear, open the hatch!” shouted the chief.

Henne sprang up the ladder, spun the wheel on the hatch and emerged, dragging the weighted bag up behind him. He immediately flung it overboard. Again, luck seemed to be with him as no bullets ricocheted off the hull. Instead a strange thick mist surrounded the submarine. The air was so foul it made Henne gag. Suddenly the water around the U-boat started to boil violently. The submarine was tossed as if it were a toy boat. Henne lurched and lost his grip on the stanchion. He could feel his U-boat begin to settle lower in the water. He realized that he was standing in water up to his knees. The hatch! Water was cascading through the opening. He worked desperately to shut it. But with one last violent motion, the U-boat suddenly pitched its bow high into the air throwing its kapitan off the deck and into the boiling cauldron of frothing water. A strong current swiftly carried him away from the death throes of his vessel. Henne’s heart sank as the boiling maelstrom swallowed the periscope mast. Sea devils! There was a muffled thud quickly followed by a loud clap. A huge slug of water and gas rose from the depths as something exploded inside the trapped submarine. Henne barely had time to wonder if it was one of the torpedoes before the shockwave hit him and he lost consciousness.

#### **1221 Hours - June 12, 1942. Aboard the *USCGC Thetis*.**

McCormick paced the bridge of his cutter. He was upset. Somehow he had misjudged the distance to the submerging U-boat. The mist was partially to blame since things often seemed closer and bigger in the fog, but that was still no excuse. *Thetis* was just entering the fog bank now, but this was no ordinary mist; the air stunk unbearably. McCormick wondered if the U-boat might have released some sort of poison gas weapon before it submerged. If so, then his ship and its crew were in immediate danger. He coughed and was about to order hard about when a loud bang reverberated through the hull of the boat. My god, he thought, we’ve been torpedoed! The water directly ahead of the cutter began to boil violently and a huge slug of water and air rose to the surface. The U-boat had blown up! But never in McCormick’s experience had he seen so much air released from any sinking vessel. He gave the command to stand clear of the area just in case the horrible smell really was some sort of poison gas.

A couple of hours later a fresh breeze had completely dissipated the mist. However McCormick noted that gas was still boiling up in a large area where the sub had gone down. His crew had pinged the vicinity with their sonar in an attempt to get a fix on the wreck, but the mass of bubbles distorted their readings. Even the depth sounder was giving back false data. Pieces of wood, some poor seaman’s coveralls and a spreading oil slick gave mute testimony to the sub’s fate, but there appeared to be no survivors. McCormick wasn’t sure if he could confidently say he’d actually sunk this U-boat with his depth charge attack, but he was certain that it was never going to come back from Davey Jones’ Locker. He logged the incident and continued his patrol.

#### **0530 hours - June 13, 1943. Several miles southeast of Black Jack Key**

The sun rose as it did everyday in the Gulf, as if the wars of men did not really exist. A small wooden fishing boat cut through the water. At the tiller was a tanned, wiry young

man who routinely scanned the seas with his gaze as all men of the sea did. His keen eyes spotted a yellow and white object bobbing in the waves, just off to port. He stood up and pushed the tiller to turn the craft towards it, not wanting to take his eyes off the floating debris for fear of losing sight of it. As he got closer, the object became more distinct and he coaxed the throttle forward to get more speed. It was a man! The lifejacket suggested it was a downed aviator or a lost sailor from a torpedoed freighter rather than a local fisherman. He came alongside, idled the engine, grabbed the lifejacket collar and pulled. The man was unconscious and his head lolled back loosely. The fisherman grunted as he hauled the man over the gunwale of his boat, just as though he were hauling in a large tuna. His heart began to pound. Under the life vest, this man wore a bloodstained white military shirt with the insignia of a swastika and eagle on it. The half-drowned sailor suddenly convulsed and vomited a belly full of seawater. He was still alive! Enemy or not, the fisherman could never deny his help to a fellow mariner in trouble. He cradled the man's head, gave him some water. Then he spun his boat around headed back towards his small island home.

#### **June 14, 1942. Black Jack Key**

Wolf Henne slowly became aware of a soft, warm breeze teasing his body. He opened his eyes and took in the fringe of palm trees, the azure water lapping on the white sand of a small beach. "I must be dead," he whispered. "Could this be heaven?" Then he moved, and pain shot through his head and chest. He doubled over with a racking cough. A firm but gentle hand grabbed his shoulder and put a cup of water to his cracked lips. Henne looked into the man's eyes. He was alive and this man must have rescued him. "Mi nombre es Pedro Sanchez," the kind face said.

Henne swallowed the water and managed what he hoped was a smile of gratitude before his eyes closed again. His last thought before surrendering to a deep and dreamless sleep was that for him the war might finally be over. What irony to have washed up into his photograph of paradise.

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#### **May 2004. Key West, Florida**

Leah Sanchez wiped her tears. She missed her grandfather terribly and felt engulfed by the emptiness of his passing. Pedro Sanchez had been a kind, simple, and deeply devout man. She looked around the empty bedroom of his small, neat home. She had packed her grandfather's lifetime into a dozen or so cardboard cartons, a difficult labor of love but one she had wanted to do. She pulled her blond hair into a clasp, regained her composure and took one long, last look around before heading back to her ship.

Leah remembered the pride in her grandfather's voice when she'd called to tell him she had graduated with a master's degree in marine science and landed a dream job with NOAA, the National Oceanic and Atmospheric Administration. He had wanted to know all the details of her job, how she was to manage the marine science projects of a brand

new but very small NOAA vessel called the *RV Researcher*. She'd told him all the details of the ship, that it was 25 meters long with a draft of three meters when fully loaded with fuel, water and stores. The crew consisted of a skipper, mate/engineer, two deckhands, an oceanographic instrumentation tech, a science project manager, and the cook. Sometimes they would bring aboard an intern or visiting scientist. Leah had told him she liked being part of a small crew because it gave her the opportunity to try everything, to become a "jack of all trades" kind of scientist. She'd taken charge of collecting water samples, temperatures, sediment, and marine specimens. She'd also learned to organize the bathymetric data obtained from sub-bottom and side scan sonar instrumentation for the mapmakers ashore. She was always busy, she told her grandfather, but she loved the work. Currently, the *Researcher* was moored in Key West loading stores for a sonar survey mission off the Florida Keys National Marine Sanctuary, and she would have to re-join her shipmates soon. Despite the loss of her grandfather, she knew in her heart that he would want her to get back out to sea. He'd always said, "Life is the greatest adventure. Live it."

Leah sighed and took one last look around grandfather's room to make sure she hadn't missed anything. Her eyes stopped on something at the back of the top shelf in the closet. Standing on tiptoe, she retrieved a battered wooden box, sneezing as she blew off a thick layer of dust. She took the box out to the porch, intrigued by its brass latch and the small rusting padlock that secured its contents. Why would grandfather lock this box? He was never a man to keep secrets. She reached for her multi-tool pocketknife, selected the awl, and tried it in the lock. Nothing happened. But Leah could be stubborn when challenged. She kept probing the lock until it finally gave a reluctant click and opened.

Inside the box was a carefully folded piece of white cloth. Her jaw dropped in surprise as she looked further--it was an old blood-soaked military shirt, if she was right about the brown stains. But it was the insignia on it that shocked her most, a swastika and eagle patch sewn over the right hand shirt pocket. She felt as though she'd suddenly stepped back in time. Beneath the shirt was an old pouch with what felt like a book inside. Leah carefully unwrapped the pouch, the waxy covering material now rigid with age, and coaxed out a small leather-bound notebook. The leather was defaced with salt crystals and water stains but she could make out the swastika and eagle imprinted on the cover. She carefully opened the stiffened pages, many of which were stuck together; the ink was smeared on some pages but most of the handwritten German script was clear. "How had her grandfather ended up with these things?" Leah wondered.

Armed only with her rusty German, Leah tackled the first few pages. Fortunately, she'd picked up a fair bit of the language during the year she worked as an intern at a German oceanographic research institute, but she'd need a dictionary for some of these words. One hour passed, then another. Leah looked at her watch and reluctantly stowed the diary and shirt back in the box, picked it up and walked to the car. She couldn't wait to show this to Nancy.

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Nancy Ketcher stretched her long slim legs, pressing against the end of the bunk with her toes. She had only a few chapters left in this particular Clive Cussler adventure novel and her eyes hurt from hours of solid reading. Nancy knew reading glasses would probably help but she refused to consider them. They were something old people wore and she wasn't even thirty yet. It would probably help if she just tackled a few chapters at a time, but she loved nothing better than to curl up with a thick page-turner adventure novel, especially ones about the sea. Cussler's *Fire Ice* had it all--strong male heroes, striking, intelligent women and powerful bad guys. This novel was especially interesting because it was about methane hydrates, something Nancy had actually worked on. The title, *Fire Ice*, was a popular name for the frozen methane gas that scientists called methane hydrate. The deep sea provides the perfect environment for methane hydrates to form – high pressure and low temperature. Under certain conditions it might be possible to ignite a chunk of this frozen methane, hence the name, fire ice. The plot detailed how the bad guys used a huge drill ship to bore into a deep-water deposit of icy methane hydrate. Normally the hydrate acted like a cap holding back the liquid methane below it. Piercing that icy cap lessened the tremendous pressure on this liquefied methane and caused the liquid to turn into a gas that expanded rapidly as it rose, creating a massive blowout. The resulting tsunami wave had the potential to inundate the coast, submerging major cities on the eastern seaboard of the United States. Of course the heroes from NUMA, Cussler's fictional government marine agency that bore distinct similarities to NOAA, would once again save the day.

The tale was page-turning fiction with exaggerated catastrophic effects, but Nancy knew that the description of methane hydrates was real enough. There were such deposits on the ocean floor and some scientists were giving them serious consideration as potential sources of energy for the world. There was history behind their discovery. In the mid-1980s, researchers had discovered areas in the Gulf of Mexico where methane and other chemicals, including hydrogen sulfide, were naturally seeping up from beneath the ocean floor. These “methane seeps” supported communities of organisms unlike any seen in the deep sea – except for those found at hydrothermal vents. Like the vent communities, the seep organisms are “fueled” by the chemicals found within the seeping fluid. These organisms include a unique species of tubeworm and mussel that are found only within the seep environment. Nancy had watched scientists dissect samples of these tubeworms and mussels, so was familiar with the symbiotic bacteria within their tissues. The bacteria within the tubeworms use hydrogen sulfide found in the seeping fluids as an energy source to transform carbon dioxide into food molecules for their hosts, while the bacteria found within the mussels use methane in much the same way. This process of chemosynthesis was similar to photosynthesis, the well-known method in which green plants used energy from the sun to make food from carbon dioxide. In addition to chemosynthesis, the seep methane also “fueled” the formation of “fire ice.” Nancy knew how amazing these seep environments were, having flown an ROV around them here in the Gulf.

Someone knocked on her stateroom door. Unwilling to put the book down, Nancy yelled, “It's open.” She was delighted when Leah Sanchez walked in. Leah was still relatively new to the ship but Nancy felt she was quickly becoming a close friend. “Glad to see you're back. You okay?” Leah nodded. Nancy couldn't help but notice the old wooden

box her friend was carrying, but remembered her manners and asked Leah about her grandfather's funeral. Abruptly Leah cut her off.

"Nancy, do you know what this is?"

"Ah, let me guess... hmmm... an old wood box?"

"No, it's a mystery," Leah said gravely. She set the box on the bunk, carefully opening the lid to reveal the stained shirt and diary. She had Nancy's instant attention.

"Wow, this looks like the real thing. Did you get this from some army surplus store?"

"No, I found it when I was cleaning out my grandfather's house. Nancy, this is an authentic diary written by the captain of a Nazi U-boat! And I'm guessing this is his uniform shirt."

For once Nancy was speechless.

"And guess what...there are passages about my grandfather in it!"

Nancy reached for the journal. She frowned as she carefully turned pages. "It's all in German. Can you read this?"

"Yeah, a bit of it. I figured out that a U-boat operating in these waters in 1942 was sunk, and its captain was the only survivor. My grandfather rescued him and took him home to his old fishing hut at Black Jack Key. I think Grandpa tried to nurse him back to health but he had some pretty serious wounds and I assume he died."

"Wow," Nancy said. "That's quite a story but what's the mystery? I've heard that there were lots of U-boats cruising around the Caribbean during World War II. It probably wasn't all that unusual that some were sunk."

"But I think this sub was different. The real mystery is about a secret cargo this particular U-boat was carrying and how it was sunk."

Leah spent the next hour detailing the parts of the story she was able to translate. Nancy listened avidly. Hearing the journal entries about the mysterious cargo, the events leading up to the sinking of the U-boat, and the brief time the sub's commander had convalesced on Black Jack Key was like a real-life adventure novel.

"Do you know the number of the U-boat?"

"I haven't been able to figure that out," Leah admitted. "You can see some of the writing has been obliterated by seawater and mold. I'm guessing that any reference to the identity of the boat was in those parts or maybe the commander didn't want it on record. I just don't know."

“Does it say where the submarine went down?” Nancy persisted.

“Well, there’s some sort of coded navigational positions in the text but I sure can’t decipher them.”

Nancy wrinkled her brow in thought. “What if we asked Captain Mack to take a look at those parts of the journal.”

“I don’t see how he could help us,” Leah said.

“Wait until you get to know him better,” Nancy explained. “His real love is naval history. You should see the books he brings on board as light reading. And his mind is like a steel trap. Heck, he can recite facts and figures for almost any maritime historical event. I bet if you showed him this diary he’d be itching to help us figure out what U-boat it was.”

“Sounds good to me. Let’s go ask him,” Leah said as she carefully repacked the shirt and diary into the box.

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Captain Whitey Mack was solid Texan, from the tips of his cowboy boots to his thatch of gray hair. His “uniform” was always a loose-fitting plaid shirt and jeans. Years at sea had tanned his face and left a fan of wrinkles around his brown eyes. Although close to retirement, he still had a full head of hair and a neatly trimmed beard. As a teenager, he’d quit school and run away to sea, trading work as a ranch hand for duty as a deckhand on small rusty tramp freighters hauling cargo around the Caribbean. When he had enough sea time, he had secured a berth on an ocean-going tug and spent years towing in every ocean of the world. Eventually he became the master of a salvage tug. By the time he was 40, Whitey Mack had seen and done more than most men, but was never one to brag about it. By the time he was sixty, he was ready for a new challenge and a change of pace. He studied the work that NOAA was doing with its research vessels, approached them with his impressive credentials, and was immediately offered the helm of the *Researcher*. Mack brought with him a reputation as an exacting taskmaster, but a fair one. Crewmembers and scientific staff agreed you could learn a lot sailing with him.

Nancy and Leah located Captain Mack on the stern deck, where he was overseeing the off-loading of *Harvey*, the vessel’s ROV. *Harvey* was being temporarily transferred to another NOAA ship and would work a deep-water recon mission in the Gulf near New Orleans. Normally the crew would use the large A-frame located on the ship’s stern to launch the ROV, but this time the robot was being moved dockside by the ship’s small hydraulic crane. The first mate Roy Woods was at the controls, carefully maneuvering the expensive ROV toward the waiting truck. Nancy watched Roy’s tanned, muscular hands expertly manipulate the levers as he soft-landed *Harvey* onto the truck bed. Too bad he was happily married, she thought. Word had it that his wife Jill worked for a national marine agency and was quite dynamic in her own right. Some women have all the luck, Nancy mused. Roy was definitely a keeper.

Captain Mack watched Nancy and Leah approach and drawled a greeting in Texan slang.

Nancy got right to the point. “Leah found something that I think you’d find really interesting. Have you got some time?”

Leah held up the wooden box, catching Captain Mack’s attention.

“You bet, young lady. It looks as though Roy’s got things buttoned up here.”

Both women followed the skipper into his cabin, tucked next to the wheelhouse. It was crowded but that didn’t seem to bother anyone as Leah carefully detailed the story behind the war diary. Captain Mack displayed no outward emotion but repeatedly stroked his beard. When Leah was done with the saga, he examined the diary pages himself and copied down some dates. Then he went over to a bookshelf that ran the full length of one cabin wall and pulled down a copy of *Torpedo Junction* by Homer Hickham, Jr. He flipped through the well-thumbed pages, reaching the appendices.

“See this list?” he said, flattening the pages of the book so they could all take a look. “It’s a record of ships sunk by German U-boats in American and Canadian waters from January 1942 to August 1942.”

“Wow, I never realized that so many U-boats were operating this close to the states,” Leah said.

“Well, let me give you a little background history,” Captain Mack began. “Japan was Germany’s ally so when Japan attacked Pearl Harbor in December 1941, Admiral Doenitz, who was in command of all Nazi U-boat operations, decided it was an opportune time to take the U-boat war to the American doorstep. He didn’t know what kind of opposition to expect, but was flabbergasted to find that America seemed so unprepared for war. We never blacked out our cities or removed our coastal aids to navigation. In fact, no convoy and escort system was instigated until the Germans had sunk an amazing amount of tonnage.”

“How many ships went down around our coasts?”

“The records suggest 285 ships damaged or sunk,” Mack explained. “That’s an amazing number when you consider that only a dozen U-boats were responsible for this slaughter over a period of some six months. The navy called it the Battle of Torpedo Junction.”

Leah and Nancy nodded in amazement. “How many U-boats did we sink?”

Mack leafed to a chart. “Looks like only seven. But this doesn’t tell how many more were damaged or how many kills were unconfirmed. By August of 1942 the American navy and coast guard made it much too hot for U-boats to be in our waters. After that date hardly any shipping losses were reported in the eastern coastal and Gulf waters.”

“What about this war diary?” Leah asked. “I couldn’t find a number for this U-boat anywhere, although a lot of the pages were badly water damaged. The captain seems to have written mainly of events and his personal feelings about his mission.”

“Well, it was pretty common for a captain to keep a personal war diary in addition to the factual ship’s log. In fact, most ships’ masters keep a journal of one sort or another.” He patted a small black leather bound journal on his own desk, then turned to another page in Hickham’s book, this one showing a map of the eastern seaboard and the Gulf of Mexico. “These are the final reported positions of merchant ships sunk by U-boat activity during the summer of 1942. Notice that there is a cluster of wrecks just offshore of the mouth of the Mississippi River. U-boats would lay in wait for ships transiting the river delta, effectively creating a blockade of all shipping coming and going out of the Mississippi. One U-boat operating in this area was the *U-166*. Legend says it was transporting illicit gold bullion from Mexico to Germany. Whether true or not, *U-166* did sink the passenger steamer *Robert E. Lee*. Soon after, the sub met the same fate when an anti-submarine patrol aircraft destroyed it. It was thought she went down in shallow water, so for the past 60 years every fisherman and diver from Louisiana to Texas spent time looking for her. But she wasn’t found until 2001. And even then it wasn’t where she was thought to be.”

“Who did find the sub?” Leah asked, caught up in the story.

Encouraged by his eager audience, Captain Mack launched into a longer explanation. “Well, a marine survey company called C&C Technologies found the U-boat wreck while running a survey for a deep water pipeline at 1500 meters. They were using a pretty advanced autonomous underwater vehicle called the *Hugin 3000*. I’m not sure but this might well be the first wreck ever discovered by an AUV.”

“I told you he was a walking history book,” Nancy confirmed.

“You sound like you’ve done a lot of research on the *U-166*,” Leah noted.

Mack smiled to himself. “I’ve been sailing the Gulf waters since I was a young man. You might say I’ve had a few occasions to go looking for her.”

“Wasn’t NOAA involved in a joint project to study the wreck?”

“Yes,” Mack confirmed. “In the fall of 2003, NOAA, C&C Technologies, and the PAST Foundation worked on it. The History Channel even sent a film crew. I asked if I could tag along in an unofficial capacity, just to see what they came up with.”

“And what did they find?”

“I’m not at liberty to say. But I can tell you that submarine is plenty interesting.”

Leah gave the captain a searching glance. “That’s what *Harvey* is going to recon, isn’t it!”

His only answer was a subtle nod. Both women realized there wasn't much more they were going to get out this veteran salvage expert, especially when it came to a search involving lost gold.

Mack turned back to the book and the mystery at hand. He leafed to another page, pointing to a map that featured a swastika symbol for each sunken U-boat location. "There is only one U-boat identified as being sunk southwest from Key West."

"Which one is that?" Leah asked leaning over to get a better look.

"U-157." Captain Mack paused to let that name sink in. Then he located other factual details. "And the Korvetten-kapitan of that sub was Wolf Henne, the same man who authored the war diary you found in your grandfather's bedroom."

"That means we have a position for the U-boat! We could actually go out and find her!" Nancy announced.

"Well, it's never quite that simple," Mack began. "That's a big ocean out there and you should know by now how hard it is to find something without an accurate lat and long."

"But it's right there on the chart in the book, isn't it?" countered Nancy.

"Yes, but a lot of factors could make that position inaccurate, maybe by as much as a hundred square nautical miles. You'd need another set of coordinates to validate the one given here."

Leah handed a slip of paper to Captain Mack. Nancy could see a series of letters and numbers written on the paper:

DM4388  
DM4312  
DM4323  
DM4331

"I copied these from the diary," Leah explained. "I think they might be position coordinates."

Mack pulled out another thick book from his shelf and opened it. He marked his place with the sheet of paper and headed out to the wheelhouse chart table, the two women trailing behind. He studied the sheet of numbers and the book, then slowly began transferring lines onto a chart of the Florida Straits. "Those numbers are the coordinates from the German navy grid system. Instead of using our latitude and longitude method, they divided the world's oceans into blocks that were then further subdivided into a grid of numbers. The numbers you gave me represent the positions of the U-boat as it made its way across the Florida Straits." He gestured at the chart. "I've converted them into lat and long and plotted the result."

Leah leaned over the chart for a closer look. One position was just south west of Key West. “That’s the position from the last entry in the diary, the one closest to where the boat was sunk!”

Captain Mack took a notebook from his back pocket and flipped it open to the lat and long notes he’d written from Hickham’s book, along with a date: *June 12 1942: lat 24-13N, long 82-03 W -position of U-157 reported by Thetis*. The women watched as he carefully plotted the coordinates on the chart.

“Oh my,” whispered Leah. “That’s it.”

The three of them stared at the chart. The position Mack had plotted was within one nautical mile of the coordinates Henne had given for the sinking of his submarine.

“I think we might just have an accurate fix on your German U-boat,” stated Mack quietly. The three of them continued to stare at the chart. Finally the captain spoke again. “For now, we’d better keep this to ourselves. And I mean don’t tell anyone anything,” he cautioned. “I’m not sure how we’ll swing it, but somehow we’ve got to take a look for ourselves. For now I’ll double-check my calculations. Leah, see if you can decipher any more of that German diary. We’ll talk about this again when I’ve figured out a plan. Until then, we’d better all try and concentrate on our regular work...if that’s possible.”

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During the ensuing weeks of project work, Captain Mack acted as if the U-boat diary had never existed. He put the ship through its paces, as visiting scientists conducted their research. Then one evening, he sent word for Leah and Nancy to meet him in his cabin. “We’re just about to finish up our regular run,” the captain began. “In fact, we’ve actually managed to get a day ahead of schedule, so I figure this might be the time when we could head for the search area and deploy the small fish for 12 hours.

“Can we justify the ship’s time for something like this?” Leah asked.

“I’ve taken care of that. You two just get your gear organized. That is if you still want to go ahead and search for it?” he teased.

“I’m in,” Leah said.

“Me, too!” Nancy added.

The *Researcher* dropped its visiting scientists, their lab samples, and data at the dock in Key West. Then just before dawn, the ship headed out to the area where the *U-157* had met its fate. Working in the rising sun’s reddish light, Nancy and Leah readied the 100kHz Klein side scan sonar towfish for deployment from the aft deck.

“Just how do you suppose Captain Mack got permission from NOAA to shorten the survey mission to look for an old U-boat?” Leah wondered out loud.

Nancy looked up at her friend as she tightened a shackle connecting the special tow cable to the towfish. “For all his interest in history, I think he’s more concerned about a potential ecological risk. If there is some sort of biological agent in those aging barrels they could be spreading toxins in the area, and that might impact the sanctuary.”

“I never thought about that,” Leah admitted. She could imagine the havoc a toxic spill would have on the marine life of the reefs in the area. In fact, she was beginning to wonder if finding that diary was more than coincidence. This mission was suddenly more than the hunt for an historic U-boat. There was a threat that had to be stopped. She only hoped the barrels were still intact inside that wreck.

The *Researcher* slowed as they reached the search area. Deckhands launched the towfish off the stern, using the A-frame. From the wheelhouse, Captain Mack scanned the horizon, noting a haze about two kilometers ahead. “That’s strange,” he thought to himself. “It doesn’t seem like the kind of weather for a mist.” He reassured himself that no other vessels showed on the radar in that direction, then nudged the throttles until they were making a nice steady three knots. He gave the con to Roy and headed down to the control shack to watch the action.

Nancy was already settled in the control shack, watching the sonar monitor and working the remote winch controls to lower the “fish” to fly at an altitude of 20 meters over the bottom. The chart indicated a fairly level seafloor some 70 to 80 meters below the water’s surface. The lines on the screen began forming an image. The range was set for 150 meters either side. The search runs would be 2000 meters long and about 150 meters apart to get a good overlap. Leah hung over Nancy’s right shoulder, her eyes glued to the screen. No less eager, Captain Mack hovered off Nancy’s left. He knew this woman was a wizard at running sonar. On one expedition she’d had the privilege of working with Marty Klein, inventor of the equipment she was now using. Nancy had coaxed him to teach her all the tricks to get the best out of the equipment. And he had. Sonar was really a black art that required almost a sixth sense for tweaking and interpreting the images coming back from the fish. Nancy was justifiably proud when he’d complimented her skills as a sonar operator.

“How do you know how far off the seafloor the towfish is?” Leah asked. “Aren’t you afraid of running it into the bottom?”

“See this dark area on the center of the screen?”

Leah nodded.

“Well, that’s called the blind zone. It’s the area the transducers on the fish cannot image. You see, they’re mounted sideways and at an angle, and because of that the transducers don’t transmit pings directly below the fish. So that black region in the center of the screen represents the lack of acoustic returns directly below the fish. That’s why we call it the blind zone.”

“Yeah, but that doesn’t answer my question. How do you measure the height off the bottom?”

“The wider the black zone is, the higher off the bottom the towfish is. And the narrower the black zone is, the closer it is to the bottom,” Nancy explained. “So I can estimate the altitude of the fish by how wide that blind area is.”

“But isn’t everything you see on the screen already gone by?”

“Yes, that’s right.”

“So what if the bottom topography rises steeply? How can you react fast enough to bring the fish up before it slams into the bottom?” Leah persisted.

“Well, that is a very real danger in some search areas. But we don’t have to worry about that here. According to the chart, the bottom is quite level and the depth steady, so there won’t be any sudden rises.”

Leah wasn’t reassured. Something nagged at her, something from the war diary. She had brought it with her and opened it, trying to read in the subdued light of the control shack. Suddenly her eyes grew wide and her heart began to race.”

“Nancy, how deep is the fish right now?”

“About 60 meters with the bottom at 81. Why?”

“I think you’d better pull up. Henne’s diary says that the U-boat struck bottom at 41 meters!”

“But the chart says…” Nancy began.

Captain Mack stepped into the discussion, concern showing in his voice. “Well, charts are never 100% accurate, and since few craft transit this part of the Straits there’s always the possibility that the chart surveys might have missed something.” Mack was about to call the wheelhouse when the intercom buzzed.

“Hey cap, this is Roy. Better get the fish up right now. The depth sounder is reading 50 meters and rising real fast. I’ll slow down while you bring it in.”

“No, Roy, don’t slow down,” Nancy shouted. “The fish will sink further!” But it was too late. They heard the engines throttle back to idle and watched as the black zone on the screen began to narrow. The fish was fast approaching the bottom.

“Nooooo,” Nancy said as she hit the remote winch control to begin hauling up the towfish. They all stared at the monitor. The bottom was rising faster than the fish was coming up. Suddenly they heard a loud bang outside the control shack as the towline snapped. The

sonar screen went black. They had just planted one very expensive towfish somewhere on the bottom.

Instinctually Nancy hit the GPS marker button on the sonar control panel to mark the position of the ship. Then she ran out to the aft rail, grabbing a cylindrical acoustic pinger from a bracket. She twisted the top until it clicked in place and threw it out over the stern as far she could. She began to cough. What was that horrible smell? She looked around, now taking better notice of her surroundings and saw a low-lying mist surrounding the ship. Leah had followed Nancy's sudden exit. She, too, was coughing as she leaned over the rail and peered into the water. Bubbles were breaking the calm surface. Suddenly the water seemed to boil and spray leaped up onto the deck. A few irregularly shaped chunks dirty brown in color, floated up from the depths. Leah pointed at them, shouting to Nancy. "What's going on? Look, this stuff is fizzing!"

Nancy couldn't believe what she was seeing; from what she knew about them, they were too shallow, the water too warm. She could barely control her coughing but managed to gasp, "I think that's fire ice."

Captain Mack entered the wheelhouse and ordered full ahead, determined to get the *Researcher* well away from whatever strange phenomenon was going on below.

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Later that morning, most of the mist had been blown away by a gentle breeze. Captain Mack had watched the phenomenon dissipate and finally felt it was safe enough to go back and recon this previously uncharted and mysterious reef. Roy felt humiliated at having lost the fish so the captain put him to work, knowing that it was like falling off a horse—you had to get right back on or be forever scared. Mack had Roy running a tight grid pattern over the area and using the depth sounder to record the depths. He had tied the depth sounder into the GPS and the bridge navigation computer. By noon they had finished and created a preliminary chart of the mysterious reef using a survey-mapping program. Mack examined the plot. It looked like a roughly shaped pyramid that rose from a depth of 80 meters to a pinnacle at 32. The reef really wasn't all that big, but it was lethal enough for a sub. No wonder it had been missed on the surveys.

On deck, Nancy was preparing to send a drop camera down. It was a real shame that *Harvey* was not aboard, she thought, because they sure could use an ROV about now. She headed back to the control shack where Leah was eagerly watching the monitor and silently worked to position the camera. Captain Mack had engaged the dynamic positioning system so he could maintain the vessel's position over any bottom area. It wasn't a perfect arrangement, but moving the ship this way would also move the drop camera to any spot on the reef. They had already decided to begin their survey by lowering the camera just off the stream of bubbles that was still rising. Two hours later, they had seen a lot more bubbles and a lot of mussel-covered reef but nothing much else. At least they were getting more experienced with positioning the camera.

“Ask Roy to run that last pass again,” Nancy requested. They stared at the monitor, as the camera got closer to the bottom. Suddenly Leah called, “Stop!” The image on the screen showed a dark unnatural shaped mass. “What is that?” Leah asked.

It was hard to see the whole object, but it was definitely different from the rocky formations they’d been looking at for hours. Nancy worked the controls, carefully lowering the camera for a closer look. “Well, I’ll be...” Nancy began. “I think you just found your U-boat.”

“And look, over there on the bottom.” She moved the video camera lower, calling over the intercom to move the ship ever so slightly. Barrels! A number of small barrels covered in marine growth.

“Ohhhh, they don’t look to be in very good shape, do they?” Nancy said.

“You can’t really tell but it looks like there’s some sort of thick, red liquid oozing out of that one there,” Leah added. She started making notes in her log then suddenly paused. “Nancy, today is June 12. That’s the same day the *U-157* had been sunk in 1942!” Was this just another coincidence, she wondered?

Just then the camera began to bounce, making it difficult to discern anything on the seafloor. Nancy looked out the control shack door and noticed that the wind had picked up and was kicking up a chop on the water. As the *Researcher* bounced, so did the camera. The rest of the video survey was frustrating, especially when they’d been so close to those barrels. Finally after another futile hour, they hauled the camera in and concentrated instead on a bevy of oceanographic tests and measurements of the site.

By evening they had gathered enough evidence to warrant a much larger expedition back to the reef, this time with an ROV. They’d also glimpsed enough of the reef to pinpoint a stream of bubbles coming up from the top of its pinnacle. Most likely it was methane. And the reef was covered in mussels, again more evidence of a methane-based ecology. The ship’s crew had new data from temperature, dissolved oxygen, and salinity measurements taken at various spots on the reef. Using a sub-bottom profiler they were even able to get a rough idea of the inner structure of the reef. It was the puzzling data from the profiler that convinced Leah to try for sediment and rock samples using a small oceanographic clam bucket grab. The grab was similar in function and design to larger ones used by cranes dredging navigation channels. Unfortunately, it was an invasive sampling technique, so she worked hard to minimize the environmental impact. Best of all, she’d secured random samples from various parts of the reef.

“Wow, I can’t believe this.” Leah said as she picked a rock sample from the grab and held it up for Nancy to see. “I think it’s an authigenic carbonate rock formation!”

“Say that in English please.”

Leah smiled delighted that she could finally add some info. “Authigenic comes from the Greek root words, authos meaning self and genic meaning made, so it means self-made

rock. At methane seeps, authigenic carbonates are formed when bacteria metabolize the methane and release dissolved carbon dioxide. When the concentration of dissolved carbon dioxide becomes high enough, calcium carbonate precipitates out of the solution, creating these rock formations.”

Leah was ready to begin a more detailed scientific explanation of the chemistry of the rock formation process, when Nancy held up her hands in surrender. “That’s enough for us simple techs.”

“Well, to make a long story short,” Leah said, “these rocks were formed by the bacteria living on this reef. In fact I’ll take a guess that this whole reef is made out of authigenic carbonates. If that is the case, there might even be caverns inside the reef structure. These rocks confirm what the sub-bottom data only hinted at.”

As they began cleaning the instruments and securing the equipment for the trip back to port, Leah thought about the painful loss of her grandfather. If only she could have talked to him and been able to listen to his story of finding the German sea captain! She put aside her regret and concentrated instead on how excited he would have been to hear that they had discovered the captain’s U-boat. But even more, he would be proud that the battered wooden box he’d kept his whole life proved to be the key to unlocking new scientific discoveries. And then there was the challenge of cleaning up the mysterious toxic dump before it damaged the coral and creatures of the sea he had loved so well. Perhaps he wasn’t gone, Leah thought to herself, perhaps he was right alongside her, watching the adventure.

Leah was already eager to start planning a future exploration of this strange reef and its mysteries. There was plenty of work to do and she knew that success would depend on pulling together a dedicated and hardworking team of energetic people. Who would take up the challenge of exploring the secrets of this mystery reef?

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#### **Some interesting notes about this story.**

Much of the story is based on real events. There really was a U-boat called the *U-157* commanded by Wolf Henne. It was sunk by the *USCGC Thetis*, which was captained by Lt. McCormick. In reading the actual account of the pursuit and sinking there were a few questions that came to mind. What was *U-157* doing on the surface at dawn soon after sinking the American tanker *Hagan*, so close to the Cuban shore? This certainly was not normal operating procedure for U-boats who usually lay low during daylight. And what was this sub captain doing heading for Key West when he had many other escape routes to choose from? These questions were tailor-made for developing the ROV competition scenario. In addition, having the sinking so close to the Florida Keys National Marine Sanctuary made a good fit with NOAA and a marine science and exploration mission.

While the scenario took some liberties with the science behind methane hydrates, they are a hot research topic these days. The reserves of seafloor methane, especially in the Gulf of Mexico, are huge and could be the fuel of the future. Unfortunately, methane is a greenhouse gas and accidental release of a huge amount of this gas into the atmosphere could accelerate the process of global warming. Research in drilling and using these reserves in an ecologically safe manner is of concern to all companies and countries hoping to exploit this potential source of energy. Scientists also realize that the biology of these methane seeps is unique. These seep sites are indeed as intriguing and puzzling as deep-sea hot vents.

The Devil's triangle, now more commonly known as the Bermuda Triangle, has long given rise to legends about lost ships and aircraft that have literally vanished without a trace. Since the discovery of methane seeps, new scientific theories have been postulated in which localized and catastrophic releases of methane gas, called blowouts, might have been responsible for a large number of these disappearances. A huge release of gas would create frothing water that would have less density than seawater. A ship caught in this froth would lose buoyancy and might possibly sink or the crew asphyxiated. A true-life example of this was found in the North Sea where an intact sunken fishing trawler was found sitting upright on the bottom right over a methane seep.

Mystery Reef is imaginary. The scenario was created to provide a model for the simulated reef you will have to explore in the MATE/Marine Technology Society ROV Committee ROV competition. The mission tasks are all based on real science measurement, sampling, observation, and exploration work done by ROVs. While the modern day characters are fictional, they are based on real men and women who study and work on and under the sea in many capacities. Perhaps you too will be a part of that dedicated group. We look forward to seeing you and your ROVs at the 2004 national ROV competition. Good luck!!!