

undercurrent

The Private, Exclusive Guide for Serious Divers

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Snorkel with Manatees, Homosassa, Florida

“it’s like Disneyland in the water”

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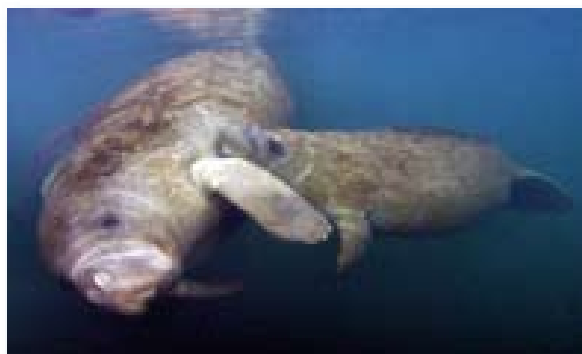
Dear Fellow Diver:

West Indian manatees surrounded me. They were waiting for me as I stepped down the pontoon boat’s sturdy ladder to slip quietly into the water. I could have even done a belly flop and not scared them away. One, the size of a large couch, nudged me from the left, another lifted me from below, and a third swished his whiskers along the right side of my face. Behind them, others appeared to be waiting their turn to get close. What attracted them to me, a human snorkeler? Obviously, they were curious as to what I was doing in their space.

A bulbous male, his face covered with warts (a condition known as cold stress syndrome), nudged me. I gently petted him. This is the only place where interaction with manatees is permissible. The dive operator, Snorkel with Manatees, was emphatic about the rules: no chasing; no diving below the surface to reach them; “do not disturb” while they are sleeping; no riding; and certainly no touching below their bellies “where their girl and boy parts are,” especially the males, who might get aroused.

The manatees have small eyes, relative to their walrus-size physiques (they’re as long as 13 feet and weigh as much as 3,500 pounds) and puckered cupid-like lips, and they literally beg to be cuddled. Some will roll over hoping for a scratch. It’s an incredible experience to be body-to-body with these amazing endangered mammals.

The 54-degree water temperature in the Gulf of Mexico during January had



Manatee with Her Nursing Calf
(photo by Dave Jaskey)



sent the manatees scurrying into the 72-degree freshwater springs near the two towns of Homosassa and Crystal River in Florida's Citrus County. Aquifers feed into the two nearby rivers, maintaining a constant year-round temperature. The abundance of manatees, which stirred the water, reduced visibility to 15 feet or less. But when a manatee is next to you, the only thing you don't see is other divers.

However, by going in January, I paid a price. Weather delays (would you believe 12 hours?) in Atlanta and a late-night flight diversion from Tampa to Orlando were followed by a red-eye drive in pouring rain on the deserted, flooded Florida Turnpike. I arrived at the Hampton Inn in Crystal River at 4:30 a.m. -- and without my luggage, which had disappeared somewhere along the way in the bowels of Delta's checked-baggage transport

system. It was 41 degrees outside, and I was scheduled to snorkel with manatees at 8 a.m. without my rashguard, 5-mil wetsuit, hood, socks and booties. Thankfully, I was able to rent a 3-mil wetsuit from Snorkel with Manatees and a prescription mask from another shop, American Pro Diving Center.

On the other hand, cold weather and water discourages casual snorkelers. More is not merrier, especially when operators welcome anyone over the age of three who will pay their price. When the Gulf is cold, sightings in these rivers and springs are pretty much guaranteed. In warmer weather, manatee sightings can be few and far between, and sometimes none at all. But with tens of thousands of tourists coming each year to Crystal River to snorkel with the manatees, I wanted an exclusive trip. After my third inquiry to the major operators, the disinterested reply sounded the same: "We leave at these times, it costs this much, and we take as many as 56 snorkelers." No thanks. I delved deeper into Google and found Snorkel with Manatees, which advertised a "maximum six-to-a-pontoon boat." I called owner Gene Parker, who recommended the Homosassa River, 17 miles to the south, which is only open for manatee snorkels from November to March. I booked two days, both the three-hour morning trips and the afternoon ones as well. When I shared my upcoming adventure with some of my longtime dive buddies at home, I got three "We're there" responses and one "maybe." So I called Gene again to ask if we could charter the boat for two days. No problem. It would be \$400 for six hours daily, and at "whatever time you want it." I jumped at it, without realizing the probability of hypothermia when spending six hours in the cold water.

Fortunately, Homosassa had real action among the hundreds of manatees. From our pontoon boat, I observed a group mating. "Watch out for the sex orgy over there," Captain Laura warned my group. During their sexual state of arousal, they can unintentionally whack a snorkeler. I observed a mother nursing her pup, a mottled baby that was chewing the rope attached to our ladder. Mom, guarding her infant, waited patiently. Like all wildlife, manatees need to be respected -- don't get between a mother and her calf. Manatees are known to "blow snot" from their nostrils when surfacing. That can be nasty if you end up as a target.

Gene and his two captains, Erica and Laura, are fifth- and sixth-generation descendents in the area. Now in her mid-twenties, enthusiastic Laura Wilds is



Snorkel with Manatees' Pontoon Boat

recorded as the youngest, at age 16, to earn her Florida captain license (that record will hold because the state raised its minimum age requirement to 18). During our 25-minute motor from the dock at Plantation Resort to Homosassa Springs, Laura shared more about these fascinating mammals. Those covered with green algae had just arrived in the river from the Gulf. While manatees mate year round, females give birth every four to five years after a 14-month gestation period. Manatees surface to breathe every three to five minutes, perhaps 15 minutes when they are sleeping. Mainly grass feeders, they'll eat water hyacinths when they are available, plus small fish and shrimp.

Lacking predators, they have no fear of humans, but few, if any, have unscathed bodies. Thanks to boat engine propellers, their backs are a road map of scars. I saw one with an unhealed chunk of missing flesh. Another killer is seaweed. Approximately 300 around Tampa Bay died last fall because they had filled their bellies with the Gracilaria seaweed when sea grass, their food of choice, was killed by multiple large algae blooms. According to the Tampa Bay News, an aggressive red tide wiped out 47,000 acres of sea grass beds, which, according to one scientist, compared to losing an entire rainforest.

I stayed at Crystal River's new Hampton Inn on Highway 19, the only place that responded to my request for a quiet room. While the view was lacking, the room was very nice, with a desk, two queen beds, a large bathroom, refrigerator and microwave. The property has Wi-Fi, a pool, gym and a complimentary breakfast. While I quickly tired of paper plates and spongy eggs, waffle lovers would be in heaven. The wonderful staff was on a daily lookout for my luggage, which took four days to arrive, even after I pressed Delta hard by phone (I was put on hold for as long as two hours). In fact, I received a call from Disney World in Orlando to inform me they had one of my two bags. Go figure.

Can Someone Give Us the GPS Coordinates to This Dive Site?

Scuba divers have discovered a primeval underwater forest 10 miles off Alabama's coast. The bald cypress forest was buried under ocean sediments, protected in an oxygen-free environment for more than 50,000 years, but was likely uncovered by Hurricane Katrina in 2005, said Ben Raines, one of the first divers to explore the underwater forest and the executive director of the nonprofit Weeks Bay Foundation, which researches estuaries. The forest contains trees so well-preserved that when they are cut, they still smell like fresh cypress sap. The cypress tree stumps span an area of at least half a mile, several miles from the city of Mobile, and sit about 60 feet below the surface of the Gulf of Mexico.

Raines was talking with a friend who owned a dive shop about a year after Hurricane Katrina. The owner confided that a local fisherman had found a site teeming with fish and wildlife. Suspecting something big was hidden below, he went down himself to explore, found a forest of trees, then told Raines about his find. But because divers often take artifacts, he refused to disclose the location for many years. Finally in 2012, he revealed the site's location after swearing Raines to secrecy. Raines then did his own dive and discovered a primeval cypress swamp in pristine condition.

"You just feel like you're in this fairy world," Raines said in an interview with LiveScience's OurAmazingPlanet. "These trees are covered in anemones and crabs and shrimp - and then you have these huge clouds of red snapper and grouper following you around. I was down there one day swimming along the ledge where the biggest stumps are, and I turned around and there was this huge funnel shape of fish behind me. It must have been 200 snapper, and they were just following me around. When I stopped, they would stop. When I turned around, they all fell in behind me. And the triggerfish, will actually come up and chew on your camera. You have to shoo them away. They just seem to have no fear."

Despite its recent discovery, the underwater landscape has just a few years to be explored, before wood-burrowing marine animals destroy the ancient forest. Raines's team is applying for research grants to explore it before that happens. But they're staying mum about their find, not giving out the GPS coordinates of the anchoring location. All we know is that the trees run along a small dropoff south of the Fort Morgan, and they follow the remains of an ancient river channel that runs to the north, toward the modern-day Mobile-Tensaw Delta.

Homosassa, Florida

Snorkeling	★★★★★
Accommodations	★★★★
Food	★★★★
Service and Attitude	★★★★★
Money's Worth	★★★★★

★ = poor ★★★★★ = excellent

Caribbean Scale

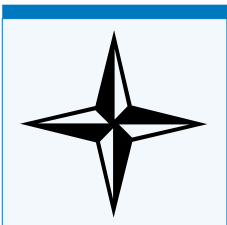
My buddies chose to stay at the Riverside Resort, basically a two-story motel, in Homosassa, which was certainly convenient because our boat docked there. Another option is the more upscale Plantation Resort along the Crystal River. It offers a spa, swimming pool, two restaurants, kayak and boat rentals, tennis and cave diving. It operates its own dive shop. More expensive than most large-scale operators at \$55 per dive, it is the only shop to offer 5-mil wetsuits. It is also conveniently located five minutes from the manatees at Crystal River's King Springs. Three-hour tours are offered between 7:30 and 11 a.m. I talked to a

mother and daughter who raved about their 12-person tour, "except for the two-year-old and her angry mother who kept kicking me in the face."

For many people, one day of snorkeling might be enough. For me, two was perfect, topped off by the incredible birdlife along the way: frigates, herons, cormorants, white pelicans, blue heron, wood storks, egrets, anhingas, fish crows that "kee" rather than caw, eagles and osprey. Great fishermen, it's not uncommon to see an osprey flying low with a fish in its talons. That's so that the bald eagle, a less-savvy angler, doesn't try to steal the prey.

Despite my Delta flight and baggage delays, I would rank this experience second to snorkeling with the whale sharks and giant mantas at Holbox, Mexico, which I wrote about for Undercurrent in 2004. As Captain Laura so aptly put it, "Crystal River is like Disneyland in the water."

-- N.M.



Divers Compass: The Crystal River/Homosassa area is about 60 miles from Tampa and 90 miles from Orlando . . . The routine at most dive shops is to check in, try on the wetsuit included in the tour, watch a video, sign the liability waiver and listen to the rules; most tours last approximately three hours . . . Florida Fish and Wildlife has the authority to shut down Crystal River snorkeling operations when there are too many boaters or too many manatees . . . There are plenty of other activities:

eco-tours, kayaking, birding, dolphin trips, scalloping (seasonal) and boat rentals . . . I recommend a tour of David Levy Yullee's 5,100-acre sugar mill, the site of Florida's only Civil War action; the Yankees destroyed his mill and plantation, and today, the island is covered with cedar, palm, oak and hammock . . . I took two extra days to fish with Captain William Toney, one of the best guides I've ever had . . . Websites: Snorkel with Manatees - www.snorkelwithmanatees.com; Captain Toney - www.homosassainshorefishing.com

Sau Bay Fiji Retreat, Fiji

a true South Seas paradise, with top-notch dive spots

Dear Fellow Diver:

Drifting across the face of the gently sloping reef known as The Fish Factory in the Somo Somo Straits between the Fijian islands of Taveuni and Vanua Levu, I noticed my dive buddy looking up at the surface. I followed her

gaze and saw the unmistakable silhouette of an undulating krait -- a banded sea snake -- 50 feet away, resting on the surface to breathe. I haven't had many encounters with them in my 30 years of diving, but as I looked back at my buddy to check her position and then up again, the snake had disappeared. We continued our drift along the reef, as I marveled as always at the colorful abundance of fish and corals. Then minutes later, I caught sight of a four-foot-long krait not 10 feet from me, poking its head into crevices looking to corner and consume a hapless fish.

Kraits pack a lethal venomous punch, so I was startled when our dive guide, Sau Bay resort owner Nigel Douglas, reached down, clasped two fingers just behind its head and slowly lifted it up from the reef. He held it for about 10 seconds and then let go. I watched it casually swim off to resume its hunt. After the dive, I asked Nigel about the risk of handling kraits. Having been born in Fiji and dived there for decades, Nigel replied that he had no reservations about gently handling them, explaining that the kraits' venomous fangs are set well back in their small mouths, so they are unable to inject venom into people-size objects wearing wetsuits. Still, I keep my distance on the off chance that a krait might think one of my fingers looked edible.

Just another day underwater in Fiji. I went in December for my third dive trip there, and my first visit to Sau Bay Fiji Retreat, on the southeast corner of Vanua Levu, Fiji's second-largest island. Nigel and his Australian wife Carol opened it in late 2012. Nigel is the son of Noel Douglas, the owner of Matangi Private Island Resort. Nigel and Carol took over a failing backpacker-on-a-budget operation in Sau Bay and transformed it with new construction while renovating the existing cottages, all elevated and just a few feet from the beach.

The setting is truly South Seas idyllic: a small sheltered bay with a gently sloping beach and three enormous "Rain Trees" at the high-tide line. The kitchen and dining building has a large deck, where I sat for drinks and good conversation, while listening to the wind and water (insect repellent is highly advised at dusk). The dining area is spacious, with only a few tables because the resort is small; I doubt you will see more than eight other guests at a time.

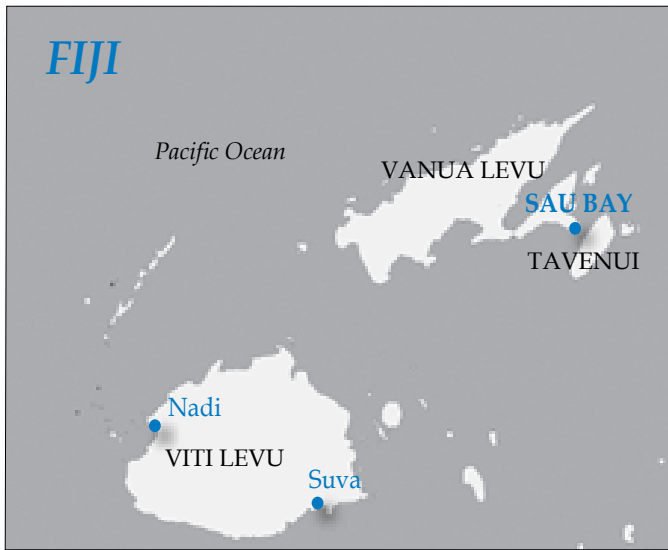
Chef Danny did remarkable things with local ingredients. One night featured a traditional and delicious Fijian Lovo meal, while another night offered a wonderful Indian dinner. There was never a lack of delicious food no matter what the hour. If we got back late from the morning dives, it was no problem to have lunch at 2 p.m. This is an advantage of a small resort with personalized service as compared to a larger operation with more guests, where they have a more regimented meal schedule.

The comfortable cottages have corrugated steel roofs, and front and side walls with floor-to-ceiling louvered windows (and curtains for privacy, of course). There is an A/C unit over the bed, but sea breezes through the louvers kept me comfortable. The bathrooms have dual sinks, a separate area for the toilet, a shower, and a heavenly private outdoor shower on the side of the cottage. A two-bedroom unit under construction is an "African safari tent" style accommodation, which will have its own private pool.

Being but 30 minutes by boat from the Somo Somo Straits, Sau Bay offers a host of top-notch dive sites. On Annie's Bommie, during a rising tide, extended soft corals in a multitude of colors were awash with fish. I spotted multiple nudibranchs and a tiny yellow-striped conch



A Cottage at Sau Bay Fiji Retreat



on a sea fan. At Rainbow's End, I dropped down through a dense school of fusiliers surrounding four threadfin trevallys, then spotted a three-foot Napoleon wrasse meander across the reef. A mature white-tip reef shark lazily approached me, then reversed course when I exhaled bubbles. Drifting with the current, I rounded the corner of the reef and saw a six-foot manta ray winging over the top of the reef, feeding on the plankton that had bloomed in November's warming 82-degree water. While visibility was less than 50 feet, it did not adversely affect my enjoyment of this incredible dive site.

Wall. It starts at 40 feet but the preferred way to experience this site is to enter a steeply sloping tunnel through the reef (keep an eye out for dwarf lionfish as you drop down) through which you quickly see the exit point at 80 feet. Then just "hang a left," and if your guide has timed it right, a current will take you for a drift along a solid wall of white soft coral extending many feet above and below you. After maybe 10 minutes, it's time to slowly work your way up the wall, where you can appreciate brilliant areas of purple, red, and yellow soft coral as well. At the top of the wall, I enjoyed watching an octopus tease us with an extended display of its camouflage capabilities.

While I was there, Nigel was using a boat on loan from Matangi Island, awaiting delivery of a new 27-foot aluminum dive boat, which should now be in service. The dive operation runs smoothly, with assistants transporting your gear and tanks -- aluminum 80s filled to 3000 psi -- from the beach out to the boat and setting it up, if you desire. While they now use an inflatable to make that connection through the long, shallow bay to the dive boat, Nigel plans to dredge a shallow channel to the dive building beside the dining hall so he can dock his new dive boat there.

While Nigel was my only guide during my four-day visit, he sometimes hires guides from nearby operations on Taveuni. He was adept at pointing out anything of interest during the dive and let my buddy and I keep to our preferred speed underwater: slow. We often spent nearly an hour per dive at 60 feet or so. At the start of each dive, Nigel would sometime drop below us for a bit but I could tell he was keeping an eye on us.

It was difficult to find much fault in paradise. Oh, the internet access was painfully slow and often unusable; however, a follow-up communication from Carol says that they now offer "high-speed" access for a fee. There was no towel rack in the bathroom, so in the humid tropical climate, my bath towel didn't fully dry when I draped it over the shower wall. Well, life is tough in Fiji, isn't it? Seriously, the cottages, food, service and diving were all outstanding. Fiji has a number of good, small resorts that Undercurrent has reviewed over the years, and while it's not a dive-focused resort, Sau Bay

Perhaps the peak diving experience in the Straits is the Great White

Sau Bay, Fiji

Diving (experienced)	★★★★
Diving (beginner)	★★★★
Snorkeling	★★
Accommodations	★★★★★
Food	★★★★★
Service and Attitude	★★★★★
Money's Worth	★★★★

★ = poor ★★★★★ = excellent

World Scale

offers terrific diving with luxurious accommodations in a stunningly beautiful tropical environment. If you're a casual diver, what more do you want?

-- L.E.



Divers Compass: I paid \$2,670, double occupancy, for four nights in a studio cottage, three two-tank dive days, all meals, the taxi from Matei airport on Tavenui to the boat pickup point, and round-trip transfers for the 45-minute boat ride to Sau Bay and back . . . There are twice-daily flights, early morning and late afternoon, from Fiji's main airport in Nadi to Taveuni, but those flights can change at a moment's notice; if the plane is full, don't assume your luggage will get on board with you, so grill the gate agent about whether your bags are being loaded onto your flight or the next one . . . Water temperatures in December hovered between 80 and 82 degrees; I wore a full-length 3mm torso/2mm extremities suit and usually added a 3mm vest for the second dive, but I typically "dive cold" (I also wear a neoprene hood) . . . Air temperatures were consistently in the high 80s by the afternoon, rain was infrequent, but you'll probably get a few showers over a one-week period; T-shirts, shorts and a rain jacket are all the clothes most people need . . . Tipping is not expected or necessary . . . Website: Sau Bay Retreat Fiji - <http://www.saubayfiji.com>

The Perils of Dive Travel

missed flights, travel agents and (egads!) gluten-free requests

It's old news that international travel is a struggle, but for divers heading to tiny islands, making same-day connections can be chancy. Frequent Caribbean travelers refer to LIAT as the "Leave Island Any Time" airline. It booted *Undercurrent* reader Todd Lichtenstein (West Orange, NJ) in December. "The LIAT flight from Antigua to Dominica was at least 90 minutes late. We boarded the plane to discover that even though we had assigned seats there were no empty seats left. We had to overnight in Antigua (which was paid for by LIAT) and missed the first day of diving at Castle Comfort."

Still, I prefer to take my chances with LIAT in Barbados, Antigua and St. Maarten, rather than use American Eagle and San Juan, Puerto Rico as a hub (if you miss a connecting flights there, it might be a couple days before you can find a seat on another). Seaborne Airlines code-shares with American and will soon code-share with Delta, so it may be a better alternative for connecting to the Windward or Leeward islands.

Frequent flyers know to expect unexpected delays. Robert Barada (Walnut Creek, CA) arrived at the Roatan airport only to find the weather didn't allow them to land. "We were diverted to San Pedro Sula and sat on the tarmac for three hours, then finally deplaned and went through Customs and Immigration, only to stand in line at the United Airlines counter to get a voucher for taxis, the Hilton Princess, and dinner and breakfast. They had armed guards patrolling the hotel and told us to stay inside -- we heard gunshots around 11 p.m. We went back to the airport at 8:30 the next morning, as the flight was scheduled to leave at 11 a.m. The weather didn't clear at the Roatan airport until about 5:30 p.m."

The Perils of Arriving on Departure Day

Unexpected delays can put you in bigger trouble if you're heading for a liveaboard trip because there may be no way to hook up with your boat once it has left port. Kerry Kiene (Kihei, HI), who was off to dive with the *Palau Aggressor* last May, says he usually plans to arrive a day early, but this time he didn't, and his airline delay caused him to miss a day of diving. Even so, he was lucky, he says. The *Aggressor* folks arranged "to pick us up at the airport when we arrived 24 hours late, and had the skiff pick us up that evening."

There are plenty of itineraries in the Galapagos, Indonesia, the Red Sea and elsewhere where a late arrival would make it impossible to hook up with your boat, and you would miss your entire journey. Of course, if you miss a day or more of diving, don't expect to see a refund, even from land-based operations. Michael Traylor (El Paso, TX) reports, "We were delayed a day getting to Little Cayman by missing a connection, and Southern Cross Club refused any refund on the night's lodging we did not use." That's standard practice. Nonetheless, you might as well ask for a credit. Just don't pout when you're refused.

High Penalties for Missed Flights

In reviewing our reader reports and talking to other divers, I'm amazed at the number of missed connections in the Philippines and the additional money spent to get home. Pam Rudy (San Jose, CA) writes that while she was at the Dumaguete Airport, "Cebu Pacific Airlines announced that our flight to Manila was delayed until the next morning, causing us to miss our late-night flight on Philippine Airlines back to San Francisco. There was no way for us to call Manila and inform Philippine Airlines that we were delayed. This led to an additional charge of \$795 per person to get on the Philippine Airlines flight the following night!"

In September, Steve Stephens (Valley Springs, CA) had reservations through two airlines -- Philippines Airlines (PAL) from the States, then Cebu Airlines from Manila to Dumaguete. When Cebu cancelled the flight back to Manila, requiring his group to postpone their flight on PAL back to the U.S. by a day, they were penalized \$2,000. Stephens notes that if he had made reservations on PAL through

Reef Life: A Must-Have Guide to Tropical Marine Life

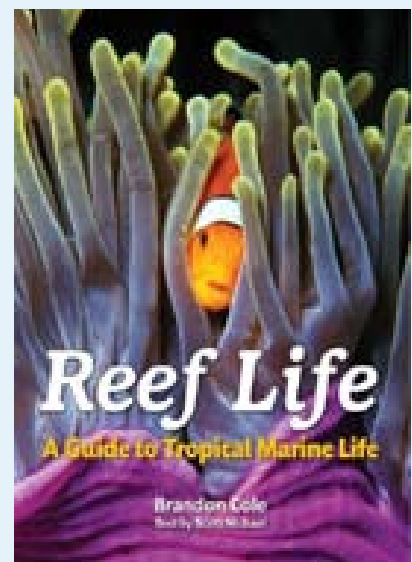
What? Another fish ID book when you thought Paul Humann's and Ned DeLoach's were enough? Yes indeed, and while I rarely say this, *Reef Life: A Guide to Tropical Marine Life* is a must-have for the library of every traveling diver. And if you only want one ID book, this is it.

You see, it's the clear and descriptive text that makes this guide special. For example, there are sections on anti-predation behavior (that is, staying off other fishes' menus), mimicry, schooling, cleaner fish behavior, food habits . . . all kinds of useful factoids about tropical reef fish. You'll learn that the indigo hamlet eats blue chromis, that the male redbar anthias chases other males away "to defend its harem," the humphead wrasse returns every night to its preferred sleeping site, the great barracuda can hit 36 m.p.h., and tuna prey on seahorses. There's nothing better than sitting around a table with your fellow divers and being able to spin these stories.

There aren't as many fish listed here in comparison to the entire Humann series, but in this paperback volume (6.5" x 7.5"), photos of 400 ray-finned fishes are featured with brief but solid descriptions, as well as sharks and rays, invertebrates, turtles, crustaceans, corals, marine mammals and ecosystems. Co-authors Brandon Cole, a marine biologist whose photos have appeared in *National Geographic* and *Scientific American*, and Scott

Michael, a writer and researcher who has consulted for the Discovery Channel and the National Geographic Channel, logged thousands of hours underwater to produce this fine paperback guide. Within its 616 pages, you will find (besides the 400 fish identified), 1,000 photographs, maps and descriptions of all the tropical diving areas -- Maldives, Florida, Caribbean, Indonesia and everywhere else.

I'm certain you'll find this a great book to peruse at your leisure or use for serious research. Click on the book's info listed on our homepage (www.undercurrent.org) to buy it on Amazon.com (where it's listed at about \$23), and we'll get about five percent of the sales price, which we will then donate to preserve coral reefs and the oceans we love (we gave away more than \$3,000 last year).



to Dumaguete, PAL would have had the responsibility for the late departure, and he wouldn't have been charged extra.

A good travel agent would have issued a single ticket, which would put the burden on the carriers, but there are other reasons to use a travel agent, especially if you need to leave your destination early, a travel agent may be your savior, as Chrisanda Button (Wesley, AR) found during her trip to Indoensia's Raja Ampat last September.

"I wish I had known that the boat did not have gluten-free flour and no alternatives were available, so the 'daily cookie parade' was torture."

"Thank goodness we booked this trip through Katie Stoyka at Reef and Rainforest. I perforated an eardrum halfway through our time on the *TemuKira*. We were scheduled to dive for another two weeks in Lembeh, but I could not dive and wanted to get home to see a specialist. We managed to send Katie an email when the boat pulled into the dive lodge to make a second night dive there. On just four days' notice, Katie managed to rearrange our flights home the day we got off the boat. We would not have been able to begin the rescheduling process ourselves until we reached Manado."

Unreasonable Meal Expectations

I pity the resorts and liveboards that must cater to Americans' food requirements. While there are plenty of good reasons for vegetarian and quasi-vegetarian diets, I live in Marin County, California, where almost everyone is some sort of vegetarian, but with footnotes like, "Well, 'caviar is ok' . . . or 'Only kosher sea food, you know, with scales. . . or 'Now and then I sneak a grass-fed beef burger.'" Many just roll with the fish or chicken stock in which their meals are cooked, or the bacon bits in their clam chowder. And me? Well I don't eat mammals -- our genetic codes are too close.

While just one percent of the U.S. population has some problem with gluten, in Marin County, gluten-free bread is everywhere, pizza houses advertise gluten-free crusts, and there are gluten-free labels on products that never had gluten -- ice cream, for example. And I have friends who won't eat farmed fish while their mates won't eat wild fish. Mr. and Mrs. Jack Sprat, I guess. And there are plenty of vegans who disdain cheese, milk and eggs, so are left essentially to graze. I make a soy-cheese pizza for vegan friends, but can you imagine how hard it is to cook for a group of picky eaters on a boat in Raja Ampat, off the coast of Costa Rica, or in a 32-diver resort in Utila, Honduras? Can you imagine how many eyes roll?

One of our readers contacted the *AquaCat* ahead of her trip to tell then she was wheat- and gluten-intolerant, and she writes us, "I wish I had known that the boat did not have gluten-free flour and no alternatives were available, so the 'daily cookie parade' was torture! I had advised the *AquaCat* months in advance, but while Chef Kirk acknowledged the issue, he was unable to offer alternatives. The food throughout the week was superb, but my choices were sometimes limited, as sauces, desserts, etc., were made with flour. Kirk did work hard to exclude flour and offer sauce-free versions, but be aware of this if you are wheat- and gluten-intolerant. Take your own flour with you for the chef to use."

Well, perhaps, but if one person carries gluten-free flour, another peanut-free flour and a third person can't stomach yeast, I have a hunch a chef on a boat of 16 guests might throw up his hands. Do your best, my friends, but if you have serious food issues, a liveboard boat may not be a good choice. In fact, many restaurants in island nations -- yes, even those at little dive resorts -- might find it difficult, if not impossible, to feed you.

Take advice from Holly Bent (Kaaawa, HI) who has "a lot of food allergies." She booked an apartment at the Kosrae Nautilus Resort so she could take care of her own needs. "I brought a few spices and canned goods from home (this was a great idea, as grocery shopping is severely limited here), then usually ordered the green salad every night from the kitchen to complement my home-cooked food. You

cannot buy fresh produce in the stores. Luckily, the resort has a great selection of in-season fruit and veggies from its own garden.”

P.S.: Some of you will surely accuse me of discriminating against those with dietary issues. Write and tell me why. Send your notes to EditorBenD@undercurrent.org.

-- Ben Davison

The Decline of Dive Training: Part I

and other practices killing the industry

On most dive trips, at some point the conversation slides into talking about “turkey divers,” novices who clearly had insufficient training and really shouldn’t be doing these dives until they develop better skills. Most often, it’s not the diver’s fault; rather, he was rushed through a course at home, had short and simple checkout dives in warm, clear water, and now finds himself facing five-foot swells, overcast skies and stiff currents in 70-degree water with 20-foot visibility. While we at times inappropriately laugh at these souls, we also fear for them because scuba can be a dangerous sport. So I asked Bret Gilliam, who has experience in more facets of the dive industry than anyone alive, to give his thoughts and then some. Here is the first section of his two-part article -- Ben Davison

Diving is a complicated sport. Not adversely so, but just like skiing, hang gliding and spelunking, there are prerequisites to be met, skills to be mastered and experience to be acquired in order to participate with an acceptable degree of risk. Notice that I said, “risk,” not “safety,” because active outdoor sports are not safe. There are hazards, and the potential exists for injury and even death, though training and practical experience can mitigate those risks. Diving also requires comprehension of subjects like embolism and decompression sickness. This isn’t bowling or golf.

I believe that in today’s troubled industry, certification programs are not preparing divers properly. It’s a complicated issue and some parties will not warmly receive my analysis. So here we go...

Adverse Reaction

Modern dive training does many things far better than when I was certified in 1959. By orders of magnitude, equipment has leaped forward in design, efficiency, safety and ergonomics. Training texts are superior, and online home-study training courses are commonplace. Retail stores, dive boats and beach access in most locations have evolved into better environments for learning and initial openwater experiences. And directly-supervised checkout dives now number at least four, up from just one years ago. So what’s the problem?

In the last couple of decades, economic pressures and a shrinking market have prompted other evolutions that began a slow slide that adversely affects diver competency and retention. As late as the 1980s, most diving instruction tended to start locally and was nurtured by dive retailers who conducted academic, pool and “open water” dives reasonably close to home. But as local conditions deteriorated and new divers were turned off by cold water, surf entries, limited marine life and low visibility, a new trend emerged: Divers were referred to warm-water regions to complete their certification. This shift was grounded in solid logic -- it was more fun. Where would you rather do your first ocean dives: through the surf in northern California, in chilly New England, in a murky lake in the Midwest, or in some warm place with more appeal? How about the Florida Keys, or the Caribbean, in warm, clear, calm waters with all the perks of a nice vacation?

Soon a symbiotic relationship developed between local training centers and resorts. Students enjoyed a smoother openwater transition, they established a dive vacation pattern, bought more equipment and

tended to stay active divers. At the outset, the model was win-win all around. Now, 25 years later, things have changed.

First, I have no quarrel with having divers complete their ocean training in warm waters, as long as they understand that such environments are easier, more forgiving and far less demanding than challenging conditions back home. They must understand that those first few qualification dives in Grand Cayman for certification only provide experience to dive in similar benign waters: 82 degrees, 100-foot visibility, little or no current and relatively placid seas. In these scenarios, a diver's age and physical fitness are less of an issue, and this is OK -- provided they are fully informed and understand their limitations.

However, in many cases they are not informed. I am actively involved in operations consulting for scores of diving industry clients worldwide. My work includes advising on specific risk management protocols. In addition, I have also been hired as an expert witness in hundreds of lawsuits (almost equally for the plaintiff and for the defense) that gives me insider access to the details of accidents that are rarely disclosed when cases settle out of court and are cloaked in confidentiality agreements. I've gained a unique perspective on training and qualifications for divers, as well as the skills of instructors and divemasters who teach the programs and conduct the dives. Here are a few objective observations firmly rooted in reality.

Matters of Concern

1. Some training agency programs, such as PADI and SSI, lead divers to believe they are more qualified than they actually are by awarding titles such as "Advanced Diver," which only require as few as nine total dives, and "Master Diver," requiring fewer than 25 dives. Some "Rescue Diver" courses are so simplistic as to be largely impractical in actual emergencies.

2. Courses tend to be abbreviated for the sake of "moving the student" through the system instead of ensuring that skills and knowledge are fully mastered. PADI claimed to use a "performance based" standard of qualification, but in one lawsuit's discovery disclosures, that premise was proved to be totally misstated. For example, if a student was asked to clear a mask two dozen times and finally got it right on the 24th time, he was passed despite the fact he did not demonstrate the ability to repeat and master the skill. In fact, the student had successfully cleared his mask just once in 24 tries! This hardly meets any meaningful standard demonstrating that the student can successfully repeat the task and has become confident, regardless of multiple certification cards in his wallet or patches on his windbreaker.

3. Students need the opportunity to make mistakes under direct supervision of an instructor, who turns the process into a positive learning experience in a controlled environment, rather than into a mistake that becomes a lesson in survival when it occurs in open water without experienced help at hand.

Cabo Pulmo: Credit Card Theft and Charming Casitas

In our January travel story on Cabo Pulmo, our anonymous reviewer noted that someone at a some local outlet got a hold of her credit card information and tried to buy a laptop at Best Buy. *Undercurrent* reader and underwater photographer Dan Clements (Everett, WA), who takes dive groups to this area several times each year, says, "I've had several folks get their credit cards 'hacked' at grocery stores, including the big-box stores in Cabo and La Paz. So if visiting this great area, be careful about using credit cards in grocery stores, and consider using cash."

Dave Whiteside (Sacramento, CA) has also been to Cabo Pulmo many times but didn't know that Alicia, famous in town for the stuffed peppers she serves at her eponymous restaurant, also rents out two charming, inexpensive casitas next door. "Can I have the phone number for her so I can call to rent?" Alicia can be reached from the U.S. at 011-52-624-151-7956, but put a Spanish speaker on the phone to make reservations, as she speaks little English. Or you can risk it by heading to Cabo Pulmo without reservations and see if she has an opening. Her accommodations are under the radar -- for now, at least.

4. Divers can qualify for instructor ratings with as few as 40 dives in some agencies. A diver can enter PADI divemaster training with only 40 dives logged. This hardly seems to meet a reasonable requirement for personal experience. Remember, these individuals will be responsible for oversight and supervision of neophyte divers, and they barely have any experience themselves.

5. No effective oversight is made within some agencies to interdict and restrict instructors who consistently breach standards that lead to unacceptable accident records.

6. Historically, the number of new certified divers has been vastly overstated for marketing purposes. Recent census reporting from the Diving Equipment and Marketing Association has confirmed this. When the database of divers is not accurate, it skews the ratio of participants' accident incident rates, and makes forecasting risk predictability and actuarial insurance ratings impossible to determine and assess.

7. Additionally, the dropout rate for divers and instructors is at a historic high. This is particularly significant for instructors and other leadership levels as it leads to replacing existing professionals with those even less qualified. This is due mostly to employment conditions and poor pay. Although dive instructor is touted as a career path by many agencies, the majority of instructors find they lack the means to obtain a

Untrained Divers Have No Place in Dangerous Caves

Cave diving is like skating on a freshly frozen pond. You don't realize you're in trouble until the ice cracks. The tragic deaths of a father and son at a cave system in Florida's Hernando County on Christmas Day (see our story "Sad but Foolish Cave Diving Deaths" in the January issue) had a familiar ring. Two untrained divers ventured someplace they had no business going and died. The scenario has played out hundreds of times before, and unfortunately, will likely play out again. The father, Darrin Spivey, was a certified scuba diver, but he had no cave training.

Learning to scuba dive is sort of like getting a driver's license. Sure, you can get behind the wheel of a car, but that doesn't mean you're ready to race in the St. Petersburg Grand Prix. No amount of open-water scuba diving experience can prepare divers for the hazards they will encounter inside a cave. The most obvious danger is a ceiling of rock. If a scuba diver encounters a problem 30 feet down in the ocean, he can surface. But cave divers don't have that luxury.

Cave divers also must contend with darkness. On land, the night often can be scary and at times dangerous. But underwater, with a ceiling overhead, darkness can be deadly. Silt, fine particles of sand, mud or clay that coat most cave or cavern floors, easily can be stirred up by an errant flipper and render the most expensive diving light useless in a matter of seconds.

To date, more than 400 people have died diving in caves. Fatalities peaked in the mid '70s, but the numbers began to drop after formal cave training became widely available. The National Speleological Society's Cave Diving Section offers a four-stage training program.

Back in the early '90s, I spent several years going through classes and diving under the supervision of certified instructors in order to write a series of stories about Florida's underwater caves. I learned that cave divers must carry nearly twice the amount of equipment as normal divers -- two tanks, safety lines, lights and computers -- backup systems for backup systems. In a cave, you can't count on anybody but yourself. I also learned that entering a cave is like running the Daytona 500. You might be fine for 499 laps -- but lose focus for a second, and you won't make it to the finish line.

Many open-water divers are drawn to caves because they've heard the tales of gin-clear water and massive caverns with white limestone walls. Most take the time to get the proper training before they hit the water. Those who don't take the time to get formally trained sometimes die. In fact, more than 95 percent of all cave diving deaths involve untrained divers. The remaining 5 percent are trained divers who go deeper than they should. Cave diving is time- and equipment intensive. It's not a casual sport, and there's no room for weekend warriors.

My instructor once offered me some advice that I remember to this day. "There are old cave divers, and there are bold cave divers," he said. "But there are no old, bold cave divers."

--Terry Tomalin, *Outdoors Editor*, Tampa Bay Times

position that will pay a living wage unless their ratings are supplemented with additional credentials, like EMS training and maritime licenses, or specific expertise in such fields as photography and videography to supplement their value to a dive business.

8. Since participation in diving has seen a dramatic decline over the past decade, there has been a corresponding decline in experienced mentors for new instructors and divemasters for on-the-job, real-world training. One outcome is declining effectiveness in the early identification of behavior patterns that more experienced dive supervisors would notice and correct. Another outcome is increased accidents.

9. A review of lawsuits and accident reporting suggests accidents, increasingly, result from a simple lack of common sense, situational awareness and maritime experience. Little of this specific training and assessment has been incorporated into many agencies' instructor curricula.

10. There is a need for enhanced training in evacuation, field assessment and treatment. Perhaps most importantly, there's a need to disqualify inexperienced divers from activities in challenging conditions.

11. Finally, while most training agencies do a credible job of developing worthy standards and procedures, many dive resorts and liveboards lack even rudimentary operations manuals that address varied field condition protocols for more advanced medical assessment, search and rescue, and adequate evacuation methods. These would also cover procedures for on-site treatment of decompression sickness with adequate oxygen and delivery equipment, along with in-water treatment table procedures, and sufficient supplies of oxygen with demand masks for surface breathing first aid.

Whew . . . that's a lot to digest. Emerging gradually over the years, these concerns have been brought on by a litany of factors, mostly due to economic strain, and for some, desperation. As more people drop out of diving, local retailers lose sales of both equipment and travel, and fewer people opt for diving as a job because the pay isn't sufficient compared to alternatives. All these elements collide as the industry struggles to sustain its business model.

Next month: The decline in divers, and other trends harming dive training and the overall industry.

Bret Gilliam is a 43-year veteran of the diving industry, with involvement in retail stores, resorts, liveboards, cruise ships, manufacturing, publishing and hyperbaric medicine. He founded the training agencies TDI, SDI, and ERDI, and served as the Chairman of the Board for NAUI in the early 1990s. He has logged more than 18,000 dives in his career.

Choose Your Dive Boat Wisely

three Thai liveboards sink in three weeks

If you're going on a land-based dive trip overseas and opting to go out with a local dive operator while there, choose wisely. From boat explosions to boat "captains" who don't keep track of divers, Second- and Third-World dive destinations are rife with accidents that injure or kill visiting divers.

Take Thailand, which had three local dive boats sink during three weeks in January and February. On January 29, the Ranong-based liveboard *Aladdin*, en route to the Andaman Sea for a four-day dive trip, sank near Koh Tachai after its hull was holed "when it ran over something in the water which was rammed into the hull by the propeller," one of the divemasters aboard told the *Phuket News*. Fortunately the Phuket-based dive boat *Peter Pan* was close by to rescue all on board the *Aladdin*, which sank so fast that passengers had to leap for their lives, many of them having no time to put on life jackets. (The priority for some passengers aboard the *Peter Pan* was apparently to take plenty of still and video footage of *Aladdin* passengers jumping off the sinking ship.)

On February 9, the *MV Blue Star*, belonging to Chalong Sea Sports, caught fire and sank in Burmese waters while on a week-long dive trip. All 20 people on board were rescued by a passing fishing boat, though they lost their belongings; a great deal of expensive dive gear went down with the 90-foot boat. Pekka Torri, principal of Chalong Sea Sports, said the fire may have been the result of an electrical fault but he couldn't confirm it.

The sinking most recently publicized actually happened on February 2, but the incident was kept quiet, with only rumors circulating around the local dive shops, until the *Phuket News* confirmed it 12 days later. Fifteen French tourists and five crew members were rescued from the *MV Bunmee I* liveboard when it caught fire and sank approximately 37 miles southwest of Koh Lanta.

Details only emerged after one diver on board, who asked to be named only as Xavier, contacted the *Phuket News* about the incident. He said the boat left Phuket around 10.30 p.m. on February 1 for a four-day dive trip to the southern sites of Hin Daeng and Hin Muang. Four hours later, someone on board

Two Deaths at One of Indonesia's Most Dangerous Dive Sites

The small island of Nusa Lembongan is 12 miles east of the Bali capital of Denpasar. It's a popular destination among divers who come to see mola molas, the giant sunfish that populate the area. But Nusa Lembongan, and especially its dive sites in Crystal Bay, is notorious for the sudden arrival of strong downward currents, so it's really only suited for experienced divers (Crystal Bay was closed temporarily in August 2012 after two divers died in separate incidents during the same week). Dave Eagleray, *Undercurrent's* webmaster who lives in Bali, says, "It's an extremely dangerous dive area, with rip-roaring currents at times. One time I dove there and, though enjoyable, I did lots of tumbles in the current and wound up separated from my buddy by more than a mile."

Sadly, a group of seven female Japanese divers, who chartered a dive boat for Crystal Bay on Valentine's Bay, learned that the hard way, as they were carried away during rainy, choppy conditions, and only five survived. They were listed as "very experienced" divers by *The Guardian* newspaper in London because they had "made more than 50 dives each." As *Undercurrent* readers know, 50-plus dives often aren't enough to withstand the full brunt of diving conditions at their worst.

Strong winds and heavy rains hit Crystal Bay while the group, five divers and two divemasters who ranged in age from 20s to 50s, was making an afternoon dive. The Japanese paper *Asahi Shimbun* quoted the boat's skipper as saying he had followed the divers for about 20 minutes after they left the boat before a sudden downpour made it impossible to keep track of them. He said he spent an hour searching for them after they failed to resurface at an agreed location. However, Didi Hamzar, the head of Bali province's search and rescue, challenged that account, telling reporters he had information suggesting that the skipper had left the area to refuel before heading to the agreed meeting spot.

After three days of search-and-rescue efforts, four of the divers were spotted on a rocky outcrop off the island of Nusa Penida, southeast of Bali and almost 19 miles from where they started their dive. The group survived by drinking from coconuts after a sudden storm turned the sea into a violent whirlpool. Saori Furukawa, a 37-year-old Bali-based divemaster, told the *Guardian* that the weather had been "serene" at the start of the day, with nearly no waves. But without warning, heavy rain fell, and the strong winds dramatically reduced visibility. "The surface of the sea started to spin like a washing machine and all of us spun around together, hand in hand," she said.

The five divers survived the first night in the ocean by drinking from passing coconuts and keeping each other awake. They later clambered onto rocks after drifting "for a long time." The next day, Furukawa left the group to try to intercept a passing tugboat, but was unable to get close. "The current was running in the opposite direction from the current where the rest of our group was, so I was swept further away from them." She survived another two days at sea by drinking rainwater before a search-and-rescue team spotted her. The other four divers were found by local fishermen.

They were rescued soon after the body of one of the other divers, 59-year-old Ritsuko Miyata, was recovered from the sea off Bali's Serangan area after being discovered by swimmers. Her husband could only identify her by her wedding ring. The search for the last missing diver, 35-year-old dive instructor Shoko Takahashi, was called off a week after the Japanese divers set out on their fateful trip to Crystal Bay.

Can Nitrox Damage Blood Vessels?

Repeat scuba dives, particularly while breathing nitrox, appear to harm the endothelium, the inner lining of blood vessels. Emeline Van Craenenbroeck, M.D., of Antwerp University Hospital in Belgium led a small study of 10 divers that showed endothelial function, which regulates blood clotting and the forming of new blood vessels, dropped significantly after each Nitrox dive -- and didn't fully recover between dives. Endothelial repair mechanisms to fix problems appeared activated as well. Based on those results, Van Craenenbroeck said that, in her opinion, the use of regular compressed air was safer for blood vessels.

"We already knew diving was bad for the endothelium," Van Craenenbroeck told MedPage Today, noting that one prior study suggested endothelial function didn't return to baseline until more than six days after just a single dive. "Diving with nitrox generates less bubbles during decompression, but elicits more hyperoxia [excess oxygen]. We know that the hyperoxia during diving elicits oxidative stress and subsequent endothelial dysfunction."

What effect these repeated dings to blood vessels' function and repair mechanisms have on the cardiovascular outcomes for frequent divers isn't known, but Van Craenenbroeck said it might lead to more atherosclerosis and coronary artery disease. Still, she says, divers have a choice in the gas mix they use, and they could attempt to protect their vessels by, say, a pre-conditioning jog before going into the water, because this method boosts oxygenation in soccer players and stimulates endothelial progenitor cells in healthy individuals.

However, Petar DeNoble, senior research director of Divers Alert Network says the study sample of 10 divers is just too small to make results applicable to all divers. "I would like to see similar results reproduced in a larger sample before accepting the results as a fact.

He also has an issue with the researcher's explanation that nitrox elicits more vascular stress. "This assumes that nitrox induces more stress on [endothelial function] based on previous studies from the same institutions, but effects of nitrox on the endothelial dysfunction have not been shown consistent across the spectrum of available studies. The dynamic of changes in [new blood vessels] may be part of normal adaptive reactions and not a manifestation of disease or injury. Without specific knowledge about true meaning of these changes, in absence of any indicators of disease or injury, one should not consider them a valid indicator of beneficial or damaging effects of one breathing gas over another. . . No big conclusions should be based on this."

smelled smoke and alerted others. As smoke began to pour into the cabin area from the engine room below, and people were forced out to the open deck. "There were flames, then the crew used an extinguisher," Xavier said. "After that, the fire was hidden by the large amount of smoke."

Everyone evacuated to the top deck, where they realized the electrical power was out. This meant no more radio, and being so far out to sea, there was no mobile phone service. Xavier said someone (obviously a very talented person) on board made an emergency battery using the boat's dive lamps, and managed to get the radio working again, but no one had an accurate idea of their position. "We were scared, of course, especially because we couldn't alert anyone to our difficulties," Xavier said. "In addition, the lifeboat didn't inflate when it was thrown into the sea -- the crew tried for 20 minutes before it inflated."

Someone on board managed to use their iPhone to get the GPS location, and around 20 minutes later, the *Bunmee I* made VHF contact with a fishing boat. "One hour later, the fishing boat found us, and we saw the boat burning before sinking," Xavier said. The fishing boat brought all back to Chalong Pier, arriving around six hours later. "No one was injured, but we lost almost all our belongings," Xavier said "Twelve of us lost our passports, and then had a 12-hour bus trip to Bangkok to get a temporary travel document before taking the plane back to Paris." The *Phuket News* made repeated attempts to contact the *Bunmee I*'s owners, Andaman Scuba, but all calls went unanswered.

So why do so many dive boats in Thailand catch on fire? One local dive company owner, speaking on condition of anonymity, told the newspaper that it's not just dive boats, it's all tourist boats. "There are three problems: First, the market is so flooded with bad, cheap copies of electrical equipment that it is impossible to buy good, genuine parts, so the parts you buy are not so reliable.

“Second, there is a lack of skilled electricians on the island. Some of them think they know what they are doing, but they don’t really. And third, we’re in business, we’re in competition. So repairs at this time of year often have to be done at night, fast, and under pressure.”

The lesson here is that considerable risks are involved any time you set foot on a local dive boat. Ken Knezick, president of the dive travel agency Island Dreams Travel in Houston (www.divetrip.com), says, “We must choose our dive operations with great care, and caution should apply to day boats just as much as it does to liveaboard operations. In the U.S., we’re fortunate that our Coast Guard takes a hands-on role in assuring the safety of all commercial and passenger-carrying vessels. This sort of scrutiny and oversight may well be lacking in the far-flung regions we visit on our remote dive travels. ”

His recommendations:

- * Only do business with well-established operations that have a successful track record.
- * Listen carefully to the safety briefings. Store your passport, wallet and other critical documents in a waterproof pouch that you can access at a moment’s notice.
- * Know where your life jacket is stored, and where to find exit hatches and emergency muster stations.
- * Mark the locations of fire extinguishers and life preservers.
- * If you see anything out of the ordinary, call attention to the captain or cruise director immediately.
- * Where safety is concerned, assume nothing.

Regarding the *Peter Pan* passengers snapping shots of their frightened fellow divers jumping ship, Knezick said, “I found it interesting that the bystanders on a nearby vessel thought the best they could do was to video the sinking for their Facebook feed. I should hope I’d have put down my camera and jumped in to assist with the rescue. How about you?”

-- Vanessa Richardson

The Perils of Deep Air Diving

how narcosis affects memory and thought processing

As you know, scuba diving comes with associated risks, and nitrogen narcosis, i.e., getting “narked,” is one of them if you’re diving on air. Increasing ambient pressure causes a form of intoxication in the brain, and the symptoms, a range of cognitive and motor deficits, start becoming apparent at depths below 100 feet.

One symptom of narcosis is memory loss, which research has shown results from impairment of As you know, scuba diving comes with associated risks, and nitrogen narcosis, i.e., getting “narked,” is one of them if you’re diving on air. Increasing ambient pressure causes a form of intoxication in the brain, and the symptoms, a range of cognitive and motor deficits, start becoming apparent at depths below 100 feet.

One symptom of narcosis is memory loss, which research has shown results from impairment of long-term memory, rather than short-term, working memory. Studies have consistently shown that narcosis impairs free recall (such as words) but not recognition memory in depth ranges of 100 to 165 feet. One possible explanation is that narcosis disrupts the encoding process of breaking down the information into a form the person understands. Material is learned but the quality of encoding it is reduced, because the nervous system has a harder time memorizing -- and thus retaining -- the information, resulting in a weaker memory trace.

Testing a Hypothesis

Wendy Kneller and Malcolm Hobbs, psychology professors at the University of Winchester in England, tested the hypothesis that narcosis disrupts processing at the encoding stage. In a typical level of processing (LoP) task, research participants are presented with words to process either in a “shallow” manner (deciding whether the word is written in capital or lower-case letters, or whether it contains an “e”), or a “deep” manner (deciding whether the word fits into a particular sentence, or whether it’s pleasant or unpleasant). If narcosis does affect the encoding of information, it’s predicted that deeper processing learned under narcosis would continue to lead to better recall than shallow processing. In contrast, another hypothesis -- that narcosis impairs self-guided search, and the impairment rests in the ability to retrieve information, not on how well it was encoded -- then deep processing under narcosis shouldn’t improve free recall.

Levels of Processing under Narcosis

Kneller and Hobbs tested the LoP effect in shallow water (a swimming pool with a depth of six feet) and in deep water (125 feet off Egypt’s Red Sea coast), using a total of 67 divers. They predicted that in shallow water, deeper processing should lead to improved recall, and that at deeper depths, free recall would be reduced but deeper processing would lessen or extinguish narcosis’s effect.

Important information that comes to divers in deep waters may not be mentally encoded properly, and may be lost when it’s important later in the dive.

The free-recall test used 30 target words, presented in the same order, displayed one at a time on a laminated card for five seconds. To test shallow processing, each word was preceded by a question about whether the word was in capital letters or in lower-case letters. After all words were shown, there was a three-minute break, then the divers were shown an underwater slate with the directive, “Write down as many target words as you can remember from those I just showed you,” and were given 90 seconds to complete the task. Then they were led back to the surface to take a break before the second test. To test deep processing, each target word was preceded by a sentence with a word missing, such as “The ___ fell off the table.” The target word below either made sense as part of the sentence or didn’t, with an equal number of both options. The divers indicated their response to each card by writing their answers on a slate.

Recall in the shallow-processing experiment was slightly lower in the ocean compared to the pool, and the same went for the deep-processing test. As predicted by LoP, recall was significantly higher in both deep-processing conditions compared to shallow-processing conditions at each depth. However, the mean age of divers in the swimming pool (age 39) was older than in the Red Sea (age 29). Prior research shows that in adults age 60-plus the ability on free-recall tests is significantly lower than that of 20- to -30 year olds, and may begin to deteriorate at age 45.

They ran the analysis again with age taken into account, and results found a significant effect of depth and level of processing, but no significant link between depth and level of processing interaction. The results demonstrated a detrimental effect of narcosis at depth on free recall performance. More importantly, once age was considered, regardless of depth, divers in the deep-processing conditions recalled more words compared to those in the shallow-processing conditions. This supports earlier studies showing that free recall performance is impaired by narcosis at depths of 110 feet and more. The results also support that deeper processing leads to much greater recall, supporting the hypothesis that narcosis disrupts the encoding stage of memory.

The Good News and the Bad News

The researchers believe the outcomes support the hypothesis that narcosis affects the brain’s process of storing memory and later retrieving it. While recall is significantly poorer at deep depths as a result of

narcosis, this deficit can be improved by utilizing deeper processing of the materials to be learned in the encoding stage. Therefore, as altering encoding can lead to changes in recall, it's likely that narcosis acts to reduce encoding effectiveness.

On one hand, that's good news for divers, as it suggests that the knowledge most impaired by narcosis is information presented at depth. Thus, prior knowledge gained in training on the surface or in shallow water (and which is important for safety or an underwater task) may be more resistant to the effects of narcosis. That's supported by previous findings that recall of information learned in shallow water isn't impaired at depth.

The bad news is that important information that comes to divers in deep water may not be encoded properly, and may be lost when it's important later in the dive or back on the surface. For example, divers entering a deep wreck may not recall important markers that lead to the exit or recall information they recently viewed on their computers and air gauges. While they state that further studies need to be done to ascertain the reliability of their findings, Kneller and Hobbes suggest that divers would benefit from using memory strategies that encourage deeper processing when learning the information that needs to be remembered later at deep depths.

"The Levels of Processing Effect under Nitrogen Narcosis," by Wendy Kneller and Malcolm Hobbs, Undersea and Hyperbaric Medicine, vol. 40, no. 3, pgs -239-245. We have taken the liberty to edit, revise and summarize this study, with apologies in advance for any inadvertent errors we might have made.

Foreign Travel Is Killing Our Dive Stores

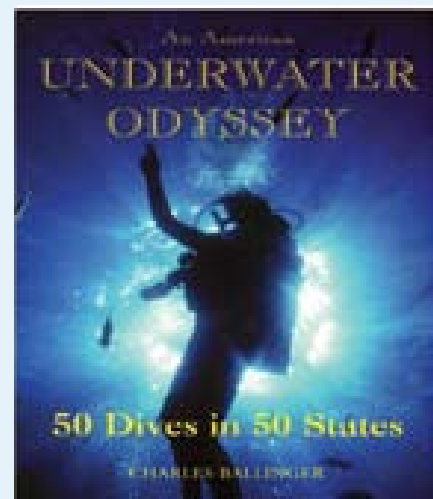
When online shopping took off more than a decade ago, most dive stores were slow to respond and many went out of business. Of the 900 shops in the U.S. these days, there is another problem. Too many of their customers are exclusively warm water divers, traveling off to tropical waters to get wet. While many gear up with expensive equipment, the hassles and the high cost of travel have lead others to rent all but their fins, masks and snorkels at their destination. Most locations even rent-well maintained wetsuits these days.

Traveling divers do not buy the kind of gear local divers might, such as weight belts. Or tanks. Or get air fills. They don't pick up the extras, such as goody bags, knives and tank totes. While organizing dive trips abroad has helped many dive stores increase their bottom line, the dive business has changed and there are fewer dive stores every year. Last year, the magazine *Dive Center Business* carried an article urging stores to publicize some of the more exceptional local dive opportunities to get more divers to dive locally. In California, there are trips to snorkel with spawning salmon, dives into large reservoirs to visits towns that were submerged when the reservoirs were created, and the occasional organized bottle and artifact dives.

At the turn of this century (sounds like eons ago), Northern California diver Chuck Ballinger struck out to

make a dive in each of the 50 states. When he finished, he chronicled his experience in the book *An American Underwater Odyssey: 50 Dives in 50 States*, a first-hand account of what he calls "adventure/safari diving." Along the way, he dived almost every kind of dive imaginable -- former nuclear missile silos, underground lead mines, volcanic craters, along with the more mundane wrecks and oil rigs. He recently put together an energetic four-minute video with a glimpse of every dive (www.youtube.com/watch?v=oCQVQorgr4w).

His 208-page paperback book, which to my eye seems as current and fresh as the day he published it, is still available at our website (www.undercurrent.org/UCnow/bookpicks2.shtml#Dive50States). It just might encourage you to hop in your car and try a new dive, foregoing excess baggage charges, long security lines and the middle seat.



Flotsam & Jetsam

Manta Rays are Safe in Indonesia. On February 21, Indonesia announced it would become the world's largest manta ray sanctuary. The archipelago's 5.8 million square kilometers of ocean are protected from manta fishing and export. That's because government officials were persuaded by evidence that mantas are worth more alive than dead -- a study published last year in online journal PLoS One said a manta ray is worth up to \$1 million during its lifetime, thanks to tourists who will pay to swim with them, but only worth up to \$500 when dead. Now conservation groups are teaching fishermen about the value of manta ray tourism, and more than 200 policemen have been prepped to enforce the law.

A Common Chemical Kills Coral Reefs. Thanks to subscriber Jonathan Scott (Waltham, MA) for alerting us to research showing that a common chemical used in many soaps, shampoos and cosmetics is killing young coral reefs at concentrations commonly found in the environment. The study, in this month's issue of *Ecotoxicology*, found that benzophenone-2 (BP-2) is toxic to coral reefs, causing increased rates of death and bleaching. BP-2 is found in U.S. wastewater, and once in the environment, can quickly kill juvenile corals at even low concentrations. BP-2 is similar to oxybenzone, the active ingredient in many sunscreens (although it's not used in U.S. sunscreens), and it's considered an emerging contaminant of concern by the EPA.

He Can't Swim with Them, But He'll Protect Them. In last month's Flotsam, we listed an item about Leonardo DiCaprio saying he was mentally scarred after swimming too close to great whites during a cage dive in South Africa. That didn't prevent him from taking out his wallet to fund marine protection efforts. Last month, he gave a \$3 million grant to the nonprofit Oceana. Spread over a three-year period, the grant will support Oceana's work to advocate for responsible fishing measures, including a ban on California drift

gillnets, which often catch and kill the 'bycatch' of dolphins, turtles, whales and other marine animals.

Coroner's Warning: Dump Your Weights. Emma Carlyon, a coroner in Cornwall, England, warns all divers to dump their weights when in trouble on the surface. This is after investigating the 2010 death of experienced diver Clive Robert Jones, who became separated from his buddy during a dive on a Cornish reef and was spotted on the surface waving for help. After a minute he slipped underwater and fellow divers later found Jones, 60, lying on the sea bed and still wearing all his weights. His computer showed he ascended 100 feet in less than a minute. The safety inspector who examined the weight belt said the Velcro surrounding the weights was too strong. While she could find no evidence why Jones had surfaced so quickly, Carlyon accepted that the weight harness Jones was wearing had been difficult to remove, and wrote in a statement, "I think it would be appropriate to write to dive organizations and to the manufacturers of this belt to highlight the difficulty, as highlighted in his case, in removing the belt and the need for divers to check they are able to release the belts."

Starfish Can See. Starfish use photoreceptors, light-sensitive organs at the tips of their arms, to find their way home if they stray from the reef. But scientists didn't know whether they're actually real eyes or simply structures that detect changes in light intensity. Resarcher Anders Garm at the University of Copenhagen in Denmark solved the mystery. He collected healthy starfish and removed the arm-tip photoreceptors from a third. He made similar incisions on another third but left the eyes intact; the remaining starfish stayed untouched. He moved all starfish from their rocks onto the sandy bottom -- where they would starve if they didn't get back to the reef. Intact starfish promptly scuttled back to the rocks. Eyeless starfish scuttled just as fast, but in random directions. That shows they need the photoreceptors to recognize and move towards the reef by forming an image of it -- which means they can process visual information. Garm thinks the visual task of navigating towards large stationary objects was an important step in eye evolution, meaning even humans' eyes evolved so we could find our way home.

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