

Undercurrent®

The Private, Exclusive Guide for Serious Divers

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Manta Resort, Belize, C.A.

- - and a second look at St. George's Lodge

Dear Reader,

How do you know if you're in paradise? Just ask Madison Avenue.

Where paradise was during the last week of January was Manta Resort, at the south east tip of Belize's isolated Glover's Reef, a large shallow area studded with coral heads, surrounded by a few small and mainly uninhabited islands. A crew of 15 showed up for three days to film a beautiful New York model named Kendra strutting her stuff in a pair of Bongo jeans. As she waded topless through water waist deep, walked up and down stairs of a ramshackle cottage, or did whatever else was necessary to get a minute worth of footage for an MTV commercial, we group of 14 divers kept our minds on diving. Of course. Afterall, isn't this just the thing we were trying to escape?

The 12 acre, palm-studded Caribbean island, home of Manta Resort, and its neighboring atoll indeed form a paradise of sorts, worthy plenty of MTV footage. Eight small, basic, wind-cooled cottages with showers and shingled roofs, can house 18 or more divers. Nestled among the palms along the lagoon, and facing the morning sun, each has a porch and some have hammocks; and, all have enough distance from the neighboring cottages for a modicum of privacy. And they're all a sufficient distance from the generator to provide peaceful snoozes. A new house with two bedrooms can house 4-8, and diehards can find beds in crew houses (as did the film crew) or even sleep in tents, which is just what a group of 36 good timers from Denver will do in February, bringing a local band from across the waters from mainland Belize for what ought to be one hell of a party.

Party headquarters (and diving headquarters too) is an attractive thatched roof circular structure in the shallow lagoon, at the end of a 200 foot boardwalk from the beach. Off to one side, two small shacks house diving paraphernalia; the dive boats tie up behind. Within the main structure, a circular bar in the center is the

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afterdive gathering place. On one side are several tables for six, at which dinner is served, or where one sits for buffet lunches or breakfasts. At the far end, doors open to the sea, making one feel an integral part of the lagoon and the reef, 100 yards beyond. Most late afternoons I found myself cozied up, here, in a wicker couch with a good book and a beer, watching the changing colors in the twilight sky, listening to the background music that was often classical or new age.

Now all of this may be shown in the Bongo jeans commercial, but what you won't see is how you pay your dues to get here. Manta runs a Saturday-to-Saturday program, loading up its 48 foot craft about 2 pm for a long and loud 5 hour journey – longer than a flight from Los Angeles to New York – across seas that may be calm, as they were on our way out, or stormy, as they were on the return trip. With two large couches and a table with padded benches, the number of comfortable seats fell short of the guests aboard, so some stretched out on the floor, while others stood on the rear deck, drinking beer with the crew and staff of Manta, who were returning for their next shift. About three hours into the ride, we were handed some flattened white-bread sandwiches, with a butter-thin layer of either tunafish or canned corned beef. For the last hour anything that looked like land led to the query "are we there yet?" At 7pm, we finally arrived. It was pitch dark.

We were greeted with a round of complimentary drinks, fed a mediocre meal of meatballs over rice – the only unimpressive meal of the week – briefed on diving and, after a nightcap, hit the sack. To connect with the 10 am Continental flight out of Houston, some people had taken a Friday night red eye and had been traveling for nearly 20 hours, enough time to fly from San Francisco to Singapore. They slept well.

The diving regimen was a single tank at 9:30 and 2:30, and dives two nights. Twin Yamahas power the 28 foot open dive boats, which are fitted with tank racks either down the center or along the side. Between dives, the crew switches gear on the 3000 psi tanks; overnight, everything is left right on board. All dives were organized identically; after a 15-30 minute trip to the site, the captain drops anchor; he and the guide help divers with their gear, then after a back roll, divers congregate at the anchor, it's weighed and divers swim with the mild current to eventually get picked up down the reef. The crew always lifted gear into the boat, and the ladder, hung over the side, was easy to climb. Though depth limits in the 90 foot range were suggested, after a couple of dives my guide paid no attention; my maximum depth was 110 feet, but reef life was mainly above 90 feet.

It's easy to characterize the dives, for they were similar. Typically they were along a wall that flattened out below 120 feet. At the top of the reef and along the wall, the hard and soft corals and sponges are alive, abundant, and beautiful.

Manta (Caribbean Comparison)

Experienced divers	★ ★ ★ (★)
Inexperienced divers	★ ★ (★)
Accommodations, in basic terms	★ ★ ★ ★
Food	★ ★ ★ ★ 1/2
Ambiance	★ ★ ★ ★ ★
Staff	★ ★ ★ ★ ★
Moneysworth	★ ★ ★ (★)

★ poor, ★★ fair, ★★★ average, ★★★★ good, ★★★★★ excellent

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Indeed, the underwater terrain is as attractive as any I've seen anywhere in the Caribbean, with waving soft corals, large basket sponges, large deep water gorgonia, and an occasional bush of black coral. It's an excellent set for wide angle photography. But, I soon realized that the fish life was less than spectacular, at times sparse, with virtually no pelagic action. Even macro life was limited. Still, first time Caribbean divers in our group were enthralled; I, much less so.

Water temperature ran 79-80 degrees; due to winds and weather, the visibility was commonly 40-60 feet, maybe 70-80 on the best day. On my first dive, fish life was minimal and aside from a common yellowtails and damsels, I saw a file fish, several large trunk fish schooling - very unusual - and a couple of small grouper. That afternoon, from the same mooring going in the other direction, I swam through a couple of streaming schools of blue chromis, bogia and creole wrasse, saw a few porgy, and encountered a four foot nurse shark, which Victor, our guide, grabbed by the dorsal causing it to swim off.

The next day at Grouper Gully, the reef was filled with gorgonia and sponges, a fair share of tropicals, and a thigh-sized grouper. With all my experience, I'd like to think that I see most everything that goes on, but as I climbed on the boat, everybody seemed to have a story. One told of seeing a reef shark. Another chased a turtle. Two others saw a rock grouper, "the size of a Volkswagen," 150 pounds. Where was I? My nose was in the reef.

After that, I pulled myself above the reef, but nothing so spectacular happened again. Yet, that's not to say I didn't have enjoyable dives. Hole-in-the-Wall was the best; at the edge of a startling white sand bottom at 35 feet, the wall begins. I dived it twice, under bright and grey skies. In the sunlight, the dull browns of the corals picked up other hues, making for an exceptional vista. As I traveled the wall, I came across an undulating tail under a coral head that at first seemed to be a nurse shark; but no, the bright green belonged to a huge moray, reminiscent of the creature in the that old Nolte-Bissett film, The Deep. At Elkorn Crossing, the dive ended in shallow water with plenty of stands of - you guessed it. Along the way, a group of us encountered a small turtle sitting in the coral. We quietly surrounded it and closed in until it decided to duck through an opening and swim for the blue.

On my dives, I encountered a few beautiful angels, colorful queen triggers, grey ocean triggers (at times followed by half a dozen blue runners), a couple of file fish, many hogfish, usually a sizeable barracuda. I saw a number of interesting juveniles, including a drum, and some unusual corals and anemones - but it often takes a sharp eyed guide to point out the unique. Victor, the house bartender who fills in as dive guide now and then, never did, swimming along at a leisurely but uninterrupted pace. He was usually first out of the water, often the victim of the cold. For those on the other dive boat, guide Stephen occasionally pointed a few things out, I was told, but on my one dive with him, I found him more a shepherd, overseeing his flock. Now, this may be all well and good for freedom, but many divers in our group had never dived the Caribbean before and, without aid from a guide, missed much of what there was to see. Victor's briefings - "we'll all go in at once, swim along and get back out" - did nothing to enhance the dive experience.

On one count, strong criticism is justified. Our guides spent many dives hooking lobster or picking up conch for the guests' dinner table. Belize law prohibits bringing anything up on scuba. Much of the reef has been fished out and shark fishermen have cleaned out the pelagics. The resort, too, scoffs at the law. That's unconscionable.

But, I ate the lobster, so I'll share the blame. Most nights chef Mark served up grouper or chicken, each with a unique sauce (mornay, papaya and mustard sauce,

e.g.), with vegetables and rice or a potato and fresh bread, followed up by a dessert, often cake. The dinners, served sitdown, were especially well prepared - a spinach fettuccine topped with fish and lobster was excellent. I had no complaints at all. One night, Mark's assistant Sylvia produced a Belizian meal, with chicken, beans and rice, and fried plantain. Lunch was the big meal and always tasty. Serve yourself to a hearty soup (often fish, but gazpacho on one hot day), a main course (spaghetti, barbecued chicken, chicken enchilada), fresh bread, a plate of cheese and ham, and always a salad with lettuce, tomato, perhaps onion or cucumber. At breakfast, I helped myself to bacon, potatoes, scrambled eggs, with a side of either pancakes or french toast, and plenty of fresh fruit, fresh bread, or cereal. For such an out of the way place, the kitchen, under Mark's leadership, did an exceptional job.

All this happens in the central dining area, where a pleasant staff of Belizeans and American expats, under the guidance of manager Hussein, originally from Lebanon, catered continually to everybody's interest. There was always someone behind the bar to pop open a beer or coke; hot coffee was always available; and problems were readily addressed. In my travels, I've found that many small places have a definite personality established by the presence of a strong owner or manager, whose identity becomes the identity of the resort. Not so here. The ever-present staff blended with the guests in such a way that it seemed simply to be one large, happy, homogeneous group.



THE COTTAGES OF MANTA

where there are corals and small fish. Tanks can be taken off the beach on the backside of the island, but no one in our group did. Each day, people tried their hands at fly fishing for bonefish in the lagoon.

Now, one caution. No see-ums, those voracious little buggers about the size of the period at the end of this sentence, are absent on windy days, but on the hot, still days, they can gnaw at you, day or night, leaving large itchy welts. Skin-So-Soft helped some folks repel the critters, but failed for others. I prefer a much stronger concoction with Deet as an active ingredient.

Leaving such a visual paradise is never a pleasant experience, but it's more unpleasant leaving Manta than most places because of the 5 am wakeup, the 6 am boat departure, and the five hour journey back to Belize City. One of our group spent a couple hours retching over the side, while a couple others barely hung on. Yet, another drank half a case of beer and never flinched. For the queasy, a Scop patch is essential in either direction.

All that time traveling gave me a lot to think about how I rate this place. Certainly 4-5 stars for cuisine, ambience, sheer beauty, and a helpful staff.

Diving, well for the experienced, 3 stars for the jaded, 4 stars for the coral freaks. For the inexperienced, 4 stars for the simplicity, 2 stars for the lack of attention by the guides. Moneysworth? At \$1095/person, double occupancy, everything included, it's fairly priced. But, since you lose a half a day on each side by the boat ride, I'd say 3 stars, otherwise four.

And now that I'm home, I'll get the opportunity to visit paradise once again on March 24, when MTV airs the Bongo ads filmed at Manta. Madison Avenue will make it five stars all the way.

Divers Compass: Belize, the first country south of Mexico on the Yucatan Peninsula, is easily reached by American, TACA or Continental through Houston, New Orleans and Miami. . . .The water catchment and desal plant together provide plenty of water, though I had a problem getting enough hot water a couple of times when everyone was showering. . . . Manta is perfect for groups; I got there by joining a trip organized by my local dive store, Harbor Dive Center, in Sausalito. . .

. There are several sets of good rental gear that come in handy if your luggage doesn't make it; one guest had to wait from Saturday to Tuesday to get hers; the resort had to persuade Continental to pick up the \$350 tab to hire a boat to bring it out. . . .there's only one compressor, so I'd hate to be there if it can't be repaired. . . .the rumor is circulating that Manta will get a Cigarette Boat to make the passage more speedy, but Manta owner, Mike Feinstein, says it will be mainly for supplies or late luggage. . . .Bring everything you need, batteries included, because if the resort can't help out, there is no place to turn.



DIVE BOATS AND RESTAURANT/BAR

St. George's Lodge --

Last June I visited St. George's, less than 30 minutes by fast boat from Belize City. Although my story reported good diving, I was disappointed by lousy visibility and said so. Some readers commented that I had been too hard on the diving, so I took three days after my Manta trip to see if the conditions were better. After my last review, Fred Good, St. George's proprietor, figured out who wrote the story, so when I arrived I could not sneak around, as I usually do. But, I paid my own freight and dived the same sites I'd previously visited undercover.

There are a number of natural reasons for bad visibility - currents, weather, runoff, plankton blooms - and not so natural reasons - dredging, sewage runoff, population. With St. George's being much closer to Belize City than Manta, should one presume visibility would always be less?

Clearly, the answer is no. In fact, where Manta visibility ran 40-60 feet, with a couple of dives better, St. George's ran 50 to 80 feet, perhaps even 100 feet at times. People seldom agree as to what the visibility actually is; if you judge by eye, then it is "apparent" visibility anyhow, because of the magnification properties of water. Some people prefer "actual", saying if you can see the surface from 120 feet, then visibility is a minimum of 120 feet. But most things I'm interested in seeing are on the horizontal, so that's the plane I use for my judgment, relying on a memory from days of yore as a college baseball player. With my fictitious Louisville Slugger over my shoulder, I look at another diver and if he can be seen as readily as if he were the pitcher, then visibility is 60 feet (I discount

the additional 6 inches). If he looks like the third baseman standing on the bag, then it's 90 feet. One day at St. George's, I could just about see the shortstop. I'm sure Manta has those days, as well.

First dive at Little Finger. I dropped to 50 feet, where the Finger begins, and followed it down to 120 feet. I was immediately impressed with a large school of jacks, probably a hundred or so, which, when I neared 100 feet, swirled around me in a circular formation. And below, a treat. Groupers congregate to mate around the mid-December to mid-January full moon and here were at least 200 scattered about, some as large as, say, 30-pounds, but most, six to eight pounds - and just everywhere. A large, free-swimming green moray did a ribbon dance a few feet away, and there were plenty of snappers, and, in the distance, a large school of black groupers. Fred dug in the sand, picked it up and let the sand sift between his fingers, and 'lo and behold, a razor fish appeared, which he gently set back down. Along the way, he spotted a number of things that he pointed out, including another free-swimming moray and a couple of large starfish, which I seldom see in the Caribbean. All in all, an astonishing dive.

Now, I had a couple of other good dives - at Ice Cream Cone there were plenty of friendly groupers; at Barry's Bush, there were two schools of jacks, grouper again, and Fred found a piece of fire coral actually being held together by a little starfish that appeared the same color of the fire coral - and one not so good. But then the highlight. On the way to Smith's Missing Finger, a number of dolphins joined our bow wave, so Fred began driving in big circles, as two of us rode the bow to watch the dolphins. He stopped the boat and we jumped in to snorkel. Below was a big school of jacks and more than a dozen dolphins; so, he tossed in our tanks and I descended 40 feet to the edge of the school of jack. For nearly 15 minutes, a score of spotted dolphin in tight pods of three to nine danced, up to the surface and back down, into the blue and back again, and into the school of jack, playfully nipping at their tails, isolating one or two, then letting them back into the school-- probably at some level just terrorizing them. One jack may have been devoured, we guessed, but for the most part what we saw was a game, not a meal. And what a splendid game it was!

Aside from the previously low visibility, I also noted that St.

George's was priced substantially above comparable Belize outposts; \$1512/person, 2 dives/day. Now they've created several special dive weeks -- with three day dives (18) and two night dives for \$1177 double occupancy (\$1388 for cottages). Computer divers are welcome. Instructors Butch Juelt and Jennifer Wagener have been added to the staff to handle the flow.

As I said in my first report, it's an adult hideaway; the food's good, the setting fine, the people friendly, the accommodations in the lodge better than adequate, in the cabins excellent, and the guides do everything they can to point out interesting critters. More fish, indeed, than Manta, less spectacular underwater scenery. You can get a more thorough run down by ordering the July, 1991 issue by sending \$6 to UNDERCURRENT, 175 Great Neck Road, Suite 307, Great Neck, NY 11021. For St. George's information or reservations: 800/678-6871; FAX 816/455-5480.

St. George's Lodge	
For demanding experienced divers	★ ★ ★ ★
For inexperienced divers	★ ★ ★ ★ ★
Accommodations, in basic terms	★ ★ ★ ★
Food	★ ★ ★ ★
Ambiance	★ ★ ★ ★ ★
Moneysworth (during dive week)	★ ★ ★ ★ ★
Otherwise	★ ★ ★
★ poor, ★★ fair, ★★★ average, ★★★★ good, ★★★★★ excellent	

C.C., travel editor

Bargains in Dive Travel: Our Recommendations

While the general downturn in U.S. economic conditions has caused some divers to put vacation plans on hold, some destinations are cutting prices to fight for what business there is.

As you might expect, Grand Cayman remains oblivious, continuing to price themselves on a par with Hawaii, it seems. There are better bargains — and in some cases, better diving. Here are a few recommendations for good diving at great prices with reputable operators that *Undercurrent* readers recommend.

Mexico has the best bargains, by far. Tropical Adventures will be offering a special dive package to Cozumel during the months of May, June and September. Barracuda Hotel (no meals served, but a few steps from town), 6 days of diving with Dive Paradise and unlimited air for shore diving at \$299/person/week.

After April 15, Landfall Productions offers four nights at Cozumel's Hotel Villablanca, two days diving with Dive Paradise for \$219/diver. They also have a Friday through Sunday night stay at Los Arcos Hotel on Baja, with two days boat diving on the Rio Rita. Includes breakfast and lunch on dive days and airport transfers.

Landfall Productions has good Caribbean values.

Bonaire: seven nights at Captain Don's Habitat, unlimited boat and beach diving, breakfast daily and 3 dinners, transfers and taxes, \$699.

St. Vincent: seven nights at Umbrella Beach Hotel, 10 boat dive package with Dive St. Vincent, transfers and taxes, \$565.

Dominica: seven nights at Castaways Beach Hotel, 10 boat dive package, transfers, \$670.

Or, book Castle Comfort and Dive Dominica for seven nights, breakfast and dinner daily, 10 boat dives, unlimited shore diving, transfers and taxes for \$756/person (1-800/468-4748).

None of the airlines who fly to the Caribbean has lowered airfares — the demise of Pan Am has lessened competition, at least temporarily — however lower fares are available through travel agents with package purchases.

But, over the Pacific, Qantas has several good round trip fares from Los Angeles and San Francisco: Tahiti \$598; Fiji \$788; Australia \$998. And, agents have put these good fares into packages for even better prices.

Tropical Adventures has a trip to Cairns, Australia and the Great Barrier Reef on the liveboard *Si Bon* for \$1395 which includes airfare from Los Angeles or San Francisco, meals, taxes and five days of diving. Both Poseidon Ventures and Adventure Express offer a two week trip to Fiji; one week aboard the *Pacific Nomad* and one week with Dive Kadavu at Matana Island Resort for \$2,859 per person. Open dates are March 7-14 on Nomad, March 14-21 at Matana and March 28-April 4 on Nomad, April 4 - 11 at Matana.

Landfall Productions offers airfare from the West Coast, seven nights at Na Koro Resort with three meals per day, and 10 boat dives, for \$1965.

Sea Fiji has seven nights in March aboard the *Pacific Nomad* and airfare from San Francisco for \$2,261 per person. They also offer seven nights, all meals, and 12 dives at the Ocean Pacific Club (air from San Francisco included) for \$1,814.

The prices quoted for many of these trips are for special periods, may begin or expire on specific dates, and require double occupancy. For more information, contact:

Adventure Express: 1-800/443-0799 (in CA 415/442-0799). Landfall Productions: 1-800/525-3833 (in CA 408/246-4710). Poseidon Ventures: 1-800/854-9334 (in CA 714/644-5344). Sea Fiji Travel, Savusavu. 011-679-850-345; FAX 011-679-850-344. Tropical Adventures: 1-800/247-5431 (in WA 206/441-3483).

Diver Damage to Reefs: Part I

—Does Touching Kill Coral?

Coral reefs are highly diverse, complex ecosystems that have evolved in the relatively stable environment of warm, shallow marine waters. Within their limits of light, temperature, salinity, low nutrients and wave action, corals are hardy organisms that not only can recover from natural perturbations such as hurricanes, but, in fact, need intermediate-level "stress" or ecological disturbance to remain healthy and diverse.

Recent studies investigating the decline in vitality in corals have led to the suspicion that man's deleterious

effect on reefs is rapidly increasing. While most coral reefs can withstand some infrequent, man-induced perturbations, they are unable to tolerate chronic, low-level, man-made stresses such as pollution by pesticides and heavy metals, eutrophication, oil and hydrocarbon pollution, and sedimentation.

Until recently, the major direct human damage to the reef was thought to be boat grounding, anchor breakage, fishing hook and line damage, and reef walking. Diver damage was considered to be negligible. However, not

only have diver populations increased, but also they have become concentrated into relatively small favored areas. Concern has grown about direct damage by divers. To determine if divers are an important contributor to this degradation, I conducted a study to ascertain how divers behave in the water and how corals react to being touched by divers' hands and fins.

Diver Impact on the Coral Reefs

From 1985 to 1990, coral reef use at the Looe Key National Marine Sanctuaries in the Florida Keys increased from 17,000 to 68,000 people per year. Divers touch corals with their hands, bodies, gear and fins, and also break corals. To determine the extent of the damage caused by this contact, I set out to study:

- the frequency and nature of the physical contact that divers make with the reef.
- how stony corals react to repeated physical contacts with divers.
- whether this physical contact is sufficient to add to the ecological stress the reefs are experiencing.

Diver Observation

Looe Key was the primary study site, but divers were also observed in the Key Largo National Marine Sanctuary, Sombrero Reef off Marathon, in the Key West area. Observations were made from charter dive boats or concession boats. Subjects were chosen at random from divers on the boats.

A total of 206 divers (113 men and 93 women) were observed during 66.6 hours of diving time. They had 1,027 contacts with the reef. (65 snorkelers were also observed.) The contacts were:

- hand on the coral to steady or to help the diver gain control,
- kicking, or brushing a coral with the fins,
- grabbing corals to pull through the water,
- rubbing against a stony coral with any part of the body,
- hitting a coral with the scuba tank or other pieces of equipment,
- creating sediment clouds, and
- standing on corals.

Ninety percent of the scuba divers had contact with the coral, while only 59 percent of the snorkelers did; 24 percent of the scuba divers had more than 11 contacts in 30 minutes. Here are a number of statistically significant observations:

- Scuba divers had significantly more contacts (an average of 7) than snorkelers (an average of 1.1).
- Gloved divers had more than twice as many contacts with coral than ungloved divers.
- Male divers had 60 percent more contacts with the reef than female divers.

In addition, other observations were:

- Hard corals were touched more often (68 percent

of the encounters) than soft corals (32 percent).

- More than twice as many incidents were recorded later in the summer than early. The early summer divers were usually out-of-state while the late summer divers were in-state.

- Three different people broke six branches of coral. This low amount could be considered insignificant, but there are few stands of branching corals alive in the Florida Keys reef tract, which probably accounts for the low incidence of breakage observed. In areas with large stands of branching corals such as the Pacific and the Caribbean, diver breakage has been reported to be an important contributor to reef degradation.

- The most frequent contacts were "finning," (704 incidents) and "pushing off," (153 incidents). The two most common contacts of snorkelers were standing on corals and the vigorous treading of water that stirs up large amounts of sediment.

The majority of divers with frequent contact were either buoyancy incompetent or simply insensitive.

Buoyancy incompetence is the result of poor training or lack of experience and practice. Mostly inexperienced divers, they were nervous and clumsy when they first entered the water, but frequently improved on their second dives.

An insensitive diver is one whose behavior is often the unconscious result of pursuit of specific activities. These capable, experienced divers love to dive, are very enthusiastic about their experiences, but are unaware of their actions toward reef life. They dive negatively buoyant and use their hands to propel themselves instead of their fins. They wipe mucus from their hands as they peer under ledges, pry into crevices and continue their activity.

"The majority of divers with frequent contact were either buoyancy incompetent or simply insensitive."

Moving or turning over "rocks" was not included in the data on diver observations because only two divers were seen doing it; one was a shell collector and the other was "harassing" a lobster. These two divers had more than 30 contacts in 30 minutes. They were experienced divers with excellent control who dove negatively buoyant to stay near or on the bottom; their attention was centered totally on their objectives.

Kicking up sediment is very noticeable when large groups of snorkelers dive where the reefs are in relatively shallow water surrounded by sandy substrate. Being inundated twice a day with resuspended sediments is

probably stressful and may reduce growth rates, change metabolism, as well as reduce fecundity and the ability of larvae to settle and survive.

Most divers observed were diving from commercial boats in protected waters of a Sanctuary. These divers were educated as to proper reef etiquette and admonished that tickets would be given if Sanctuary officers witnessed

an offense. This may account for the relatively low rates of diver contact observed.

Next issue: What effect on the reef do these divers really have?

The author, Helen Talge, has lived in and dived the Florida Keys for more than 30 years. She has studied coral bleaching on the Reefs of St. Croix and is completing her Ph.D. at the Department of Marine Sciences, University of South Florida.

The Myths of Nitrogen Narcosis

—As told by the deepest diver ever

Due to the adoption of a 130-foot diving limit, much discussion of narcosis theory has been conducted “underground” by diving professionals without a public forum of information exchange. With the willingness of *Undercurrent* to tackle more controversial issues, we have a forum that goes beyond simple condemnation of any diving practice that does not apply a “lowest common denominator” standard.

Some of the earlier accounts by Cousteau relate instances of near total incapacitation at depths of only 150 feet and cite the supposed “Martini’s Law” and the classic romantic broad generalization of “Rapture of the Deep.”

In reality, the severity of impairment is drastically reduced in well-trained and well-equipped divers with adequate experience at depth. Narcosis is certainly a factor to be dealt with responsibly, but many texts suggest levels of impairment that are far exaggerated. I can personally attest to this, having made more than 2,000 dives below 300 fsw. In fact, February of 1990, I set a new depth record on air of 452 fsw in Roatan.

With experienced deep divers, “adaptation” to narcosis takes place. A gradual work-up over several days to increasing depths is the best recommendation. For the diver who regularly faces deep exposures, a tolerance far in excess of the unadapted diver will be exhibited. I also advocate facial immersion breathing prior to significantly deep dives. This process institutes the “diving response,” thus lowering heartbeat and respiration. A dramatic reduction in these rates has been recorded in the author and observed in other individuals.

For deep diving, of particular importance is a regulator that can comfortably deliver adequate volumes upon demand. Many so-called “professional” models will fall sadly short on performance below 200 feet. Exhalation resistance is a prime factor in breathing control, perhaps more so than inhalation ease. Studies have shown exhalation detriments to be the most significant fatigue factor in underwater breathing tests. Slow, deep ventilations with minimal exertions will keep CO₂ down and reduce onset and severity of narcosis.

So how do you choose between the dozens of models offered? Some benchmark can be derived from perusal of U.S. Navy test reports, but the results can offer inconclusive appraisals. The Tekna 2100 series basically failed the Navy tests for high performance but has been a

popular regulator with many experienced deep divers since its introduction. I used it on my record dive.

The power of suggestion

A variety of factors may contribute to narcosis: hard work, heavy swimming, cold, alcohol use or “hangover” conditions, fatigue, anxiety, motion sickness medications, lack of an “up” reference such as in bottomless “blue water” or in severely reduced visibility, and increased oxygen partial pressure.

But, there is evidence that diving deep properly is more a mental exercise than a physical one. Let me cite a study conducted in 1965 by psychiatrist Dr. Gilbert Milner and professional diver Tom Mount. Three control groups (each with four students) received identical dive training with the following exceptions:

- Group One was taught that a diver will get narcosis at 130 fsw, and much emphasis was placed on the high probability of narcosis with severe symptoms.

- Group Two was taught of the existence of narcosis, the symptoms and depths of occurrence cited as beginning at 100 fsw.

- Group Three received three full hours of lecture on symptoms, risk, danger and known research. They were told that divers with strong will power could mentally prepare themselves and greatly reduce the effects of narcosis.

Prior to the actual test, all students were taken on a 50 foot dive and a test situation conducted to familiarize the students with the testing procedures and a mental/dexterity familiarity level could be achieved for later comparison.

In the initial test to 130 fsw, all those in Group One indicated minor to average narcosis problems, while those in Groups Two and Three indicated few noticeable affects.

At 180 fsw test depth, two divers from Group One dropped from the exercise due to severe narcosis problems and were dropped from the dive. All Group Two divers were affected although still functioned at about a 50 percent level. Group Three divers indicated minor impairment.

At 200 fsw, the rest of the Group One divers and two of the Group Two divers dropped out. At 240 fsw one

diver from Group Two and one from Group Three dropped out, the balance indicated levels of impairment but they were not severe.

Thus, it would appear that conditioning divers to expect narcosis impairment at 130 fsw led to actual impairment. From my own experience, I had no significant impairment at 452 fsw for a brief exposure of approximately 4.5 minutes. I admit, however, that this is the extreme end of adaptation: I had dived every week for more than a year, never more than a six day lay-off. My 627 dives during this period included 103 dives below 300 fsw.

Overcoming impairment

The deep diver must be constantly aware of his own limitations and not hesitate to abort a dive if impairment becomes unreasonable. There is a wide range of individual susceptibility. Almost all divers will be impaired eventually.

Initially, divers will notice a reduced ability to read fine gradations in a depth gauge or watch along with increased awareness or sensitivity to sound, such as inhalation and exhalation noise. Short-term memory loss and perceptions of time can be affected. Other symptoms may be: lightheadedness; slowed mental activity; overconfidence; numbness and tingling in lips, face and feet; levity or tendency to laughter; perceptual narrowing; and less tolerance to stress.

With experience, divers can learn to overcome and control these deficits to some extent. But these very real dangers cannot be underestimated. A diver unaware of his depth, bottom time or remaining air volume is about to become a statistic!

To recognize impairment in companion divers, I suggest a simple hand signal exercise. If one diver flashes a one-finger signal to another diver, the diver should answer with a two-finger signal. A two-finger signal should be answered with three fingers. If a diver is not able to respond quickly and correctly to the signal, then sufficient impairment can be presumed and the dive

aborted. Over the years, scores of experienced deep divers have reported using the "Gilliam narcosis signal" with success.

"Conditioning divers to expect narcosis impairment at 130 feet led to actual impairment"

Although narcosis is eliminated by ascent, it is important to understand that many divers will experience some degree of amnesia of their performance. Commercial divers have reported successful completion of work only to learn later that the work was not accomplished at all! Less experienced deep divers typically will not remember their greatest depth or bottom time unless they have recorded it on a slate prior to ascent. Dive computers significantly provide safer controls with maximum depth and time memories as well as decompression planning models. Many divers report digital gauges easier to read at depth than analog units.

Experience is vital before attempting progressively deeper dives. Ideally, the diver should be seeking the benefit of training by a competent, deep-diving instructor before any penetration below sport diving depths. Several deep-diving training centers are already in place, and more are planned in some ideal Caribbean locations. Hopefully, this will fulfill the need for qualified deep-diver education and eliminate the current Catch-22 of "no deep diving without experience," but no place for the diver to gain such experience safely.

The author, Bret Gilliam, has been in the diving business for two decades, serving as an instructor, dive shop owner, charter captain, and senior officer aboard the Ocean Spirit. Gilliam is currently president of his own diving consulting business, Ocean Tech.

Force Fins Revisited:

In our October issue, we published the results of scientific testing of swim fins, derived from a master's thesis of Michael Yee at UCLA. The author stated that "The Reeflex and Plana Concorde fins consistently outperformed the other designs, while the Force Fin, a much smaller design, routinely achieves the poorest results."

These conclusions have raised a few hackles. A Force fins representative called, claiming there were studies with contrary results, but they have not been produced for us. Fred Calhoun, organizer of the Boston Scuba and Travel Show, was steamed enough to question the entire

—the defenders rise...and fall

study in a letter to 110 dive shops:

"The recent *Undercurrent* article on Force Fins (and others) reinforces the fact that you shouldn't believe everything you read in that pamphlet. The writers of the article decided, through some exercises that they orchestrated, that Force fins were the least efficient fin of all the ones they "tested." The physics of swim fins isn't something that many people understand.

"It's important to note that it's not possible to measure the efficiency of a swim fin. I've made 84 dives this year wearing my Force Fins, and I've found them to be very

At last, a Nikonos Single Lens Reflex

After more than 20 years of speculation and anticipation, Nikon has announced the development of a 35mm single lens reflex underwater camera, expected to hit the market this summer. Any bets? Called the Nikonos RS, it is slightly larger than the Nikonos V and weighs about 4.5 lbs topside and a little over 2 lbs. underwater. It is pressure tested to 328 feet.

The RS was introduced in Houston in January at the Diving Equipment Manufacture's Show to choruses of "ooh's" and "ah's". "Ooh's" were especially reserved for the price — we're talking a list of \$3154 for the body alone.

The bells and whistles are comparable to Nikon's land cameras: auto-focus; freeze focus; focus tracking; action finder; automatic loading; TTL exposure; matrix-metering for fill flash; focal plane shutter; automatic film advance; automatic rewind; interchangeable lenses; plus the ability to over-ride all the controls and do most of it manually. The electronics are driven by a 6V lithium battery.

At present, Nikon has developed three lenses for the RS: a 20-35mm f/2.8 zoom (\$3,077); 28mm f/2.8 (\$846); and 50mm f/2.8 (\$1,146), all with double bayonet lens mounts that are air and water tight. These lenses, corrected for underwater use, are not usable on land, but more lenses will follow. The new SB104 Strobe system lists for \$1,693.



NEW NIKONOS RS

While photographers have waited forever for the Nikonos SLR, enterprising manufacturers have developed compact housings capable of holding virtually any land SLR with appropriate zoom and wide angle lenses — at a total price less than the Nikonos system. Whether the trend by serious photo-graphers to house their Nikon or Pentax or Canon in Tussey or Ikelite housing will be stemmed by Nikon's new entry, will take a while to find out. But, the extraordinary price of the Nikon RS (pundits say the RS stands for "real 'spensive") clearly makes this a camera for the most dedicated underwater photographer.

And, good news for Nikonos V users. Nikon's Deborah Kogan tells *Undercurrent* that they will continue to manufacture and support the Nikonos V.

comfortable (the first criterion of a good fin) and very adequate to the task of moving me through the water. I come back to the boat, having spent as much time in the water as anyone else and usually with more air left in my tank."

We contacted Dr. Glen Egstrom, professor of Kiniseology at UCLA, and a long time NAUI leader, who shepherded the study by Yee. After reading Calhoun's comments, Egstrom helped set things straight:

"As I understand it, the criticism is that in the study design, it was the performance of the people involved that was subject to scrutiny, not the fins. To an extent that is true. What is not reported in the article is that each dive was videotaped and these tapes were looked at very carefully to determine the shape of each fin in use and how each diver performed their kicking.

"The purpose of fins is to move someone through the water more effectively than what might be accomplished without fins. Thus, repeatable measurements of air consumption, heart rate and distance over-time can be applied to any fin or group of fins for comparative purposes.

"At UCLA in the late 1960's, we developed an underwater force measuring platform, which would

permit us to standardize the diver's position and develop reproducible work loads. We then instrumented a variety of subjects to measure changes such as heart rate, respiration rate, amount of thrust, et.al., and videotaped their performance during several work levels of the same duration.

"It would be possible to make a machine that a fin could be mounted upon and, controlling the "effort" of the machine, measure the amount of thrust each fin developed. But such a machine would have to include components which simulate humans, i.e., differing leg lengths, leg strengths, ranges of motion at the ankle joint and other physical characteristics which may affect the fin in use. But the results would indicate what the machine could or could not do, not what humans might experience.

"Comfort is a subjective measure that may vary from one individual to another. How much finning or how far a diver may travel during a dive are other uncontrollable variables. But measurements of time over distance, air consumption and heart rate, with different subjects using each piece of equipment under identical conditions are controllable and do not introduce any more biases than would be present with a machine.

"By using a group of subjects of various dimensions, a

good general picture of fin performance can be obtained for comparative purposes. The data presented is objective and without the type of bias represented in Calhoun's letter."

We received several letters about Force Fins, and the opinion was about split.

Dear Mr. Davison:

Regarding your October article on fin evaluation, I have logged 48 dives with my Force Fins (two trips to Roatan and two weekend trips to the Flower Gardens in the Gulf of Mexico). Previously, I used "Power Plana" fins. While the Force Fins do produce somewhat less thrust, the Force Fins are vastly more comfortable; there is no pinching or constriction of the toes, and I am less prone to develop leg cramps. These benefits are especially evident after several days of diving on a week-long trip.

While the other fins tested may indeed be more efficient and better suited to coping with heavy workload situations (such as swimming against a stiff current), does it really make that much difference to the resort divers among us who principally frequent places like Bonaire and Roatan? For a leisurely week of diving the walls at CoCo View, I wouldn't trade my comfortable Force Fins for any others.

Robert D. Shaklovitz, Houston, TX

Dear Mr. Davison,

I concur completely with your findings about the Force Fin. I only wish that I had received this issue of *Undercurrent* a week ago. Your article would have saved me from falling victim to some slick ad copy about robotic efficiency testing and a desire for a more packable fin. Any suggestions for what I can do now?

Barry Riddle, Chesterfield, Virginia

Dear Barry,

Why not pack them up and take them back where you got them. Any retailer or manufacturer worth their salt will take them back if you tell them you are absolutely dissatisfied and consider the claims inaccurate. Let us know what happens.

Ben Davison

Dear Mr. Davison:

I am a 6'1", 165-pound, 54-year-old diver with five years of diving experience. I'm hardly the sort of person that one would envision fitting the "Gorilla" image of ScubaPro's Sea Wings, but I am an endurance athlete and I do some weight training.

My first fins, Mares Power Plana, were too much for me. For whatever reason — I suspect stiffness of the fin was the problem — I simply could not comfortably use

the fin. I suffered cramps in the arches of my feet during the dive as well as extreme fatigue in both my hip flexor and Tibialis anterior muscles.

Theorizing that I needed a fin with less resistance, I switched to the Sea Wing. It was more flexible, had vents, and was shorter. I don't know much about physics, but I guessed that these three characteristics would decrease resistance. The Sea Wings are easy to use, haven't caused me any physical discomfort, and are relatively fast (compared to the Force Fin).

Not leaving well enough alone, and having become a techno-freak, I couldn't resist buying the Force Fin. Without taking any of their advertising hype into account, three things were immediately apparent: they were extremely comfortable; they were noticeably slower than the Sea Wings, and they allowed me a greater amount of control when I was hovering for photos. Specifically, it was far easier to move backwards using the Force Fin than any other fins I've used; and, since the Force Fin provides a much smaller amount of forward motion with each kick cycle, it was easier to make minute attitude adjustments while taking photographs.

Since I don't dive to win races, the slowness of the Force Fin was only a problem when I needed to keep up with my dive buddy on shore dives. Once on the reef they were adequate. In addition to comfort, though, the Force Fins offer one major advantage — particularly for the underwater photographer: being short, they are much easier to keep off the reef when doing close-up work. This should be a primary consideration to any diver who cares about the beauty and integrity of our underwater playgrounds. Certainly, this factor should weigh heavier in our fin-purchasing decision than underwater speed — unless the type of diving one does requires the ability to cover long distances underwater. Except for that particular situation, though, I wonder if underwater speed should be a factor in a diver's evaluation of fins.

That brings us to the focus of your evaluation: workload and its effect on air consumption. I agree with the obvious conclusion that the easier the workload, the less air used, but except for the situation cited above or when diving in strong currents, I question whether workload need be a major consideration. Good dive sites are meant to be savored, not rushed past. So, if we dive to enjoy the beauty of the underwater world rather than cover a lot of ground, then a moderate-to-slow pace should not cause us to expend a lot of energy and air propelling ourselves through the water.

One could even make a case for comfort being a more important consideration. A diver who is comfortable in the water and not bothered with equipment that cramps or causes fatigue is going to be a safe diver.

Jerry Kassanchuk, Golden Valley, MN

*Undercurrent editors welcome comments, suggestions, resort/travel reports, manuscripts, reports of equipment problems, from readers of Undercurrent.
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