

# undercurrent®

THE PRIVATE, EXCLUSIVE GUIDE FOR SERIOUS DIVERS

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## Tax Deductible Diving For Science

*-- Fiji, Bonaire, And Cayman Coming Up*

Dear Reader:

I have a fantasy that will never be fulfilled: to become a Calypso diver and spend my days helping save our water planet. It would be great fun.

Though it will always remain a dream, you and I have ample opportunity to assist in legitimate undersea research. Several nonprofit organizations sponsor 10 days, 2 weeks, or even longer trips to exotic places where experienced divers join in the research. The cost is usually no more than any vacation trip -- for ten days it seems to run about \$1500 plus airfare. As a bonus, the full cost, including air fare, is tax deductible because you are engaged in legitimate research on behalf of a legitimate nonprofit organization. In reality, that means as much as a 33% price reduction.

This month one of our Undercurrent correspondents, who has joined several of these expeditions, will relate her experience -- and give you a sample of just what might be in store if you select research as your vacation experience.

\* \* \* \* \*

Long ago I gave up resort and liveaboard boat diving where I would begin with a welcome rum punch, then between dives pamper myself with meals and drinks and pass time with a book. Oh, I enjoy it, but I prefer more "serious" diving -- getting my hands dirty, so to speak, while learning about the sea in a greater depth than an evening slide show by a divemaster. You see, I've found a way to become an Indiana Jones, a member of Cousteau's team, an underwater explorer. For years my partner and I have joined expeditions to the far parts of the world, all in the name of science and good diving, and for the most part I've had quite a time of it.

Earthwatch, University Research Expeditions, and CEDAM ("Conservation, Education, Diving, Archaeology, Museums") International are the major groups

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sponsoring tax-deductible research trips. Earthwatch, by far the largest, has initiated 950 projects over the years: you can study anteaters in Australia, observe and record currents in Alaska, or monitor unusual photosynthetic processes in Brazil. Annually, they offer more than a half a dozen trips involving scuba, and this year offer a trip with Eugenie Clark to study sharks in a submersible off Grand Cayman to depths of 3,000 feet!

To give you a flavor of what's in store, let me run down several trips I've taken, all but one of which were very worthwhile. I'll tell you about it too.

My best was a trip to Bonaire, where the "Dark Reef Interior" project has run for eight years -- and apparently will continue for many more. Principal Investigator for this project is full-bearded David Kobluk, a charismatic professor of geology from the University of Toronto, who is researching the "Ecology and Geology of Tropical Reef Cavity Systems."

Each summer, he typically takes three teams of volunteers who live and work at the site for about 12 days. On my trip we began with a briefing about the nature of the project and received daily briefings and assignments. It was generally my task -- and the task of others -- to make three dives every two days to depths from 20 to 140 feet to bring up samples of the walls, sand, etc. from underwater cavities or to map and identify the location of a variety of marine flora and fauna. The work, perhaps 5, 6, even 8 hours a day, in conjunction with David's lectures, explanations, and fine story telling was absorbing. And Bonaire's waters are themselves a delight.

While the character of the living-conditions is inevitably limited by the nature and location of the project, it's of considerable importance in trip quality. At Bonaire, my partner and I had a room in an air-conditioned bungalow right on the water, from which I could walk out to typically great Bonaire beach front snorkeling whenever I wished. Food (cooked by David and Mary Lysenko, his research assistants) was very good and available in quite awesome quantity. And our non-diving duties were superbly organized so during our off hours we could behave like any Bonaire tourist, thanks to a car provided us as participants in the project. We would drive to town or off to the many super shore-diving sites, all quite easy to find and quite easy to dive. And, of course, night-diving was excellent right off our veranda.

The quality of the experience is a function of the leadership, plain and simple. David and Mary made each volunteer feel appreciated and fulfilled to such an extent that it is hardly surprising that Earthwatch has more people reapplying for "Dark Reef Interior" than for any other project. It's nice to leave a dive trip knowing that I had contributed to preserving the ecology of the area, especially waters so pristine as Bonaire's.

My next Earthwatch venture, called "Homeward Bound," was quite a contrast. My partner and I went to the Canary Islands, off the Coast of Africa, to observe and perform experiments on the homing instincts of tidepool fish. Unlike tropical Bonaire, it was full wet suit water, and there were no tropical coral

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reefs, though a variety of stone reefs and other formations provided shelter for numerous, if less colorful fish.

This was a virgin project and it was our task to help principal investigators, James Dooley and James Van Tassell, set it up. A new project is a mixed blessing. There was an understandable amount of confusion as we all felt our way towards establishing routines and patterns for the daily work. At the same time, being part of the crew who initially implements a project is an interesting challenge -- something a bit different than jumping aboard a boat off Cayman's Seven Mile beach. And both Jims were friendly and open to suggestions or expertise offered by the volunteers.

The research required shore teams to trap fish in tidepools and bag them for diver teams to release in specified spots underwater to observe how and where they swam. We performed a variety of experiments, including examining the effects of magnetic currents and light on the homing orientation of our fishes. The work was interesting, and the daily oceanography lectures were helpful and informative. I've kept in touch with the progress of our detailed accounts of the data sent by the investigators.

Spontaneous recreational diving was difficult, but the Jims arranged several special dives, including a trip by private yacht to a rocky reef several miles out in the ocean where we saw tuna, jacks and other pelagics. A trip was also offered to Lanzarote Island, with a tour of volcanoes and camel rides and we were treated to an all-day tour of the Island of Gran Canaria, with historical, ethnological and ecological commentary.

We shared comfortable units with kitchenettes (we cooked our own breakfast) overlooking the resort area of Gran Canaria, where, it seems, all Europe comes to play. Lunches and dinners were in restaurants and one chef, claimed to be one of the finest in Europe, provided super cuisine. But, horrors! The Spanish dinner hour often occurred at midnight or later, a difficult time after a day of diving, especially since we were too busy diving during the day to have time for a siesta

Another Earthwatch project I offer as an example of what to watch out for. Called "Reef Genesis," it was seductively located on Orpheus Island in Australia's Great Barrier Reef. The goal was to examine when, where and how a particular type of coral polyp releases its planulae, or larvae. We frequently dived at night to observe the number, direction, and speed of the planulae. We dived some days to collect specimens and position equipment, but most of the daily work was routine cleaning and preparing of equipment. The visibility was only mediocre due to silt in

#### Tax Deductible Research Projects: Who To Contact

Earthwatch has several trips for divers in 1988. A few examples are: "The Dark Reef Interior of Bonaire," May and June; "Sex Changing Danisels" at Lizard Island, Australia (held in January, but look for it next year); "Red Sea Reef Fish," Gulf of Aqaba, Eilat, Israel, June, July and August; "Diving for Sea Squirts" near Adelaide, South Australia, February and March; "African Lake Fish," August and September. Earthwatch is a membership organization with annual dues of \$25. You may get a current catalogue for no charge by contacting Earthwatch, 680 Mt. Auburn St., PO Box 403, Watertown, MA 02272. Telephone them at 617/926-8200.

University Research Expeditions is sponsoring two summer trips this year to research the coral reefs of Fiji and Tonga. For more information contact University Research Expeditions, University of California, Berkeley, CA 94720.

CEDAM is operating several programs in 1988. Archeology, mooring buoy and whale skeleton projects in Belize in March and April, Galapagos Marine Study in May, Honduras fish collecting in July, and Red Sea fish collecting in September are just a few. For more information send one dollar to CEDAM at One Fox Road, Croton-on-Hudson, NY 10520 (914/271-5365).



suspension, but the underwater life was all one could expect of near-shore Great Barrier Reef. I found the study interesting and the few lectures entertaining and enlightening.

So what went wrong? The basic lubricant for these expeditions is the leadership capacity of the principal investigator or the prevailing individual among the investigators. No matter how fine a scientist one may be, his or her ability to supervise, encourage and otherwise relate to the volunteers (who indeed pay for the expedition) is fundamental to the success of the endeavor. On Orpheus Island, we volunteers were treated with patronizing contempt. We were given orders with little or no attention to our preferences, subjected to periodic moral lectures on our putative laziness and irresponsibility, and generally made to feel we were a necessary evil in the fund-raising process. It was, however, grimly fascinating to watch this pervasive attitude transform a group of highly motivated, conscientious and enthusiastic volunteers into a collection of potentially mutinous fellow-sufferers who maintained their spirit only by wry humor and group elan. Suffice it to say that nearly two-thirds of the volunteers (though not we) elected to leave the project several days early, despite the monetary loss involved. Earthwatch no longer supports the project, and sent letters of abject apology to those who wrote of our experiences.

How can you insure yourself against this sort of disaster? You're probably safe if you join a project that has been running for several years. Earthwatch will supply names and addresses of volunteers on any previous project. A new project is difficult to predict, but you might check with students or colleagues of the principal investigators. Earthwatch, of course, is a highly reputable organization and they do satisfy customers to get repeat business.

University Research Programs helps University of California scholars. In 1988 they have two sponge-study projects in Fiji and Tonga, most likely to be run by the same investigators who led a sponge study in Tonga in which I took part. There we lived aboard a boat and dived for sponges identified for us by Professor Phillip Crews of U.C. Santa Cruz. We chopped up the sponges and put them in bottles upon which Phil performed chemical machinations in search of new medical properties. And when he was through, we washed the bottles and started over again. Phil's leadership style was relatively easy-going and friendly, but there was a minimum of free time and the recreational dives were pretty unilaterally determined. He did negotiate two great native island feasts.

Last fall I returned from a CEDAM expedition to the Red Sea. CEDAM, founded in 1967, specializes in marine/terrestrial archaeology and marine biology. Collecting, observing and exploring expeditions have been mounted to the Galapagos Islands, Mexico, Belize, Venezuela, and Honduras. The directors, Rick and Susan Sammon, led my trip to collect specimens for the New York Aquarium. They're an enthusiastic, high-intensity pair who are deeply devoted to the organization and whose attitude towards the work is contagious. This ambiance, in the context of CEDAM's small size, indeed gave a personal, "family" feeling to the project. Our technical advisor was Dr. Ernie Ernst of the Aquarium, a man not only appropriately knowledgeable on the subjects at hand but given to sudden, dazzling bursts of classical scholarship.

Along with a group of 14 volunteers, we flew to Tel Aviv for the night, then next morning to Eilat where a bus took us through Israeli customs. Subsequent processing through Egyptian customs lasted nearly two hours in the hot desert, the delay deriving less from suspicion than from curiosity and boredom on the part of the officials. We boarded a non-air-conditioned bus for the 4-hour ride down the Sinai Peninsula, through dramatically stark mountain and desert terrain



occasionally enlivened by small settlements of mud huts or tents, somberly-garbed Arabs and their camels.

We pulled into Sharm El Sheik, hot and exhausted, and only 500 yards from our boats. But the Egyptians in the port office had recently acquired this marvelous X-ray machine to examine large packages. So once again we unpacked our enormous amount of equipment and carted it in to be viewed with fascination on the screen. Finally, we reached our boats -- and a supply of iced beer!

And so I set out for 7 full days of diving and fish-chasing in some of the most colorful underwater scenery I've experienced. We lived on two boats: 6 volunteers, captain, crew member and cook on a smaller sailboat and 8 volunteers, captain and 2 crew members and cook on a larger yacht. Accommodations were close but comfortable and the Israeli food was more than adequate.

Our goal was to collect the maximum number of approximately thirty kinds of fish: flashlite fish, goldfish ("anthias"), hawkfish, particular varieties of trigger, tang, butterfly, angel, goat, goby, surgeon, wrasse, damsel, blenny, chromis and miscellaneous others. To protect the fish from potential damage, we had to forego knockout drops and slurp-guns in favor of simple and highly inefficient old-fashioned butterfly nets. While much of the time our eagerness outran our ability, we ultimately garnered 38 specimens of which 28 survived the journey home to the Red Sea Room of the New York Aquarium.

The beauty of the Red Sea underworld is legendary. The color is riotous, with all shades of graceful soft corals providing a background for masses of golden, purple, orange, crimson and multicolored reef fish. Even the groupers seem extraordinarily endowed with new and dazzling shades. I was particularly charmed by a human-sized Napoleon wrasse who followed us about with such friendly curiosity that every diver could reach out and pat him. In all, we made about fourteen dives at a variety of anchorages. The owner-captain of the boats, Freddy Storheil, was expert in locating particularly spectacular coral heads for us to explore. And while our primary job was to catch fish, we were given considerable freedom to combine the work with our individual photographic projects. Altogether, I found it a most satisfying expedition!

I think that the kinds of people one meets on research trips are different than those encountered on normal dive trips: perhaps more curious, interested in broader environmental or geographical issues, a little more willing to rough it. Many are teachers (some of whom are on scholarship from their schools). I derive a great deal of pleasure in forging an immediate camaraderie among people who have not only come to dive together, but to work and explore together. I leave feeling as if I have accomplished something in the name of environmentalism. And I don't miss the welcoming rum punch one bit.

## Leaving A Boat Empty Topside

### *-- Why Some Operators Violate Coast Guard Regulations*

What's your reaction when you're about ready to enter the water and you realize that no one will be left on board the boat. It may depend upon what kind of diver you are and how far from the shore you're diving, but even the best divers may have some concern in rolling seas or rugged waters.

There is no doubt that divers below are safer if

there is someone above who can maneuver the boat. Not only can a captain get a boat to an injured diver, but also a captain can control a boat that breaks loose from its anchorage.

In United States waters, the U.S. Coast Guard requires that the boat captain be on board at all times. In Hawaii, many dive operations don't comply with



the Coast Guard regulations, so at least one operation that claims to comply -- Kona Coast Divers in Kailua-Kona, Hawaii, has been campaigning to get other operations to follow Coast Guard regulations. They received the following interpretation from Captain C.W. Gray of the Honolulu Coast Guard:

"The licensed individual must remain with the vessel at all time it is in navigation. A vessel underway is in navigation and a vessel engaged in a voyage with passengers is in navigation when at anchor....A dive charter boat which carries passengers out to a dive site where it may be anchored for a relatively short period of time before returning to port, clearly is in continuous navigation throughout the voyage and is required by law and regulation to have a licensed individual on board at all times. Licensed individuals who also serve as divemasters and fail to stay with the vessel have been charged to appear at an Administrative Hearing and have had sanctions placed against their license."

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*"While the Coast Guard requires a vessel such as ours to have a licensed captain on board at all times of operation, it does not require that person to be either a swimmer or a diver. It also doesn't stipulate that the person on board even has to be awake -- just be on board."*

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Robert A. Voge, operations manager of the Kona Coast Divers, freely admits that he has business and safety motives for involving the Coast Guard. He wrote *Undercurrent*:

"Some of our reasons for pursuing this may seem selfish in that we have always had and will always have a captain on board during dive operations for hire. We are more than a little concerned that anybody can come into town with a boat and some diver gear and go into business. We recently had an incident that could have been a drowning had we not had a captain on board. A diver was washed onto the rocks receiving a severe cut on her head and was knocked unconscious. The divemaster in the water looking for her couldn't see her in the foam at the shore line, but the boat captain did spot her and directed the divemaster to her."

Coast Guard regulations apply to all waters under U.S. jurisdiction, including Florida, and the U.S. Virgins. But once into the independent Caribbean countries no such government regulations exist. However, any dive operation which carries PADI boat insurance, must have a person aboard the vessel at all times to keep the insurance enforced.

Regardless of Coast Guard regulations and PADI rules, many U.S. operations don't comply with these standards. One Hawaiian operation which does not comply agreed to tell us, off the record, why it does not go along with Coast Guard regulations.

"While the Coast Guard requires a vessel such as ours to have a licensed captain on board at all times of operation, it does not require that person to be either a swimmer or a diver. It also doesn't stipulate that the person on board even has to be awake -- just be on board. We feel that the best safety factor is to keep the number of dive guides and divers to a low ratio. That way we know when there might be a problem and can deal with it right then. If someone needs help we are right there to help. The maximum ratio we ever have is one guide to four divers, others have one guide and 14 or 15 divers plus a man on board. We feel it is far safer our way than the Coast Guard regulations. If we put a captain on board who did not get into the water, it would cost around \$15,000 per year extra. So we would either have to increase our fees or drop one or more of the dive guides. As far as the insurance problem goes, if we have a problem which leads to a claim or suit, we would not have insurance. Since we did not comply with the requirements, it would be looked upon as a variance of the requirements and we would be in the position, not of having the policy cancelled, but of not having insurance. We have never had an accident and we feel that our policy is as safe as we can make it. We carry oxygen, a first aid kit and a kit for treating allergic reactions, should it be needed. Another factor is that we are seldom more than 20 minutes from shore and can get back in a hurry if the need arises."

Good rationale, but it doesn't solve the problem of a drifting boat or not being able to spot another diver from the surface. Nor is there an answer if the captain/divemaster runs into a problem underwater and becomes incapable of operating the boat?

Interestingly, Coast Guard regulations do not permit the boat to be operated if there are divers in the water. If a diver is in trouble, regulations require that all people get back into the boat before the boat is moved.

Compliance with the regulations varies from state to state. In Southern California, for example, the captain as well as the divemaster stays on board. The divemaster checks divers in and out of the water and acts as a safety diver if someone gets in trouble.

For dive boats at many foreign resorts, there is no government policy; the dive operations are beholden only to the requirements of their insurance policies. For one example, we called UNEXSCO, in the Bahamas, where a spokesman said "UNEXSCO keeps a man on board if the weather reports indicate changeable conditions, if the wind or seas are high, or if the boat is carrying both divers and snorkelers. Otherwise no one is left on the boat during a dive."

For many operations the decision to keep someone on board is based not only upon economic considerations, but also upon water and weather conditions. Although as an individual diver you can question the practice of not leaving someone on board a boat, it's unlikely that a protest will ensure that someone holds



down the helm while you dive.

For the most part, you must follow the most elementary rule taught in any basic scuba course. If you don't feel comfortable with any of the conditions of the dive, abort it. Which is something I should have done once upon a time when I found myself well over a mile off the St. Maarten shore on a small

outboard-powered boat. The waves were 4 feet high and the instructor jumped in with us, leaving the boat unattended. I spent the whole dive feeling certain that the boat would break loose and I would be forced to make the swim to shore against the outwardly flowing current. It was not a fun dive.

Ben Davison, Editor

## Paying For That \$15,000 Air Ambulance

### -- A Smart New Insurance Program

A bends hit can put an enormous hole in your bankroll -- if you can, at all, get someone to fly you to a chamber. Bends victims must be transported to a chamber in an air ambulance which can hold cabin pressure at sea level. Such a flight can cost \$5,000, \$10,000 or more. Furthermore, before the plane leaves the ground you have to pay for the service -- you'll need a high limit on your credit card for this one -- or proof that your insurance will cover it. Waiting to verify payment can be very painful to the injured diver and time, precious time, is lost in getting to treatment.

Full treatment can be expensive. We reported an instance where a diver had to be air evacuated and required 14 days of hospital treatment for a total tab of \$33,538, and that did not include the treatment costs incurred at the place of the incident.

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*"You may think it cruel that air ambulances require money up front for injured divers, but tourists treated in foreign lands are notorious for not paying their bills."*

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You may think it cruel that air ambulances require money up front for injured divers, but tourists treated in foreign lands are notorious for not paying their bills. We recently spoke with Dick van der Vaart, MD, the doctor in charge of the recompression chamber in Bonaire. He's treated ten tourists in the past 16 months. Five have failed to pay the \$2000 chamber treatment bill, including one New York attorney who owns a home on the island. (We promise not to name him and tell how he -- or other people who got bent in Bonaire screwed up -- if he -- and the others -- pay their bill in the next sixty days).

This wouldn't be such a hassle if insurance had been readily available. Now, thanks to DAN, the Duke University based Diving Alert Network, a new policy is available. All one needs to do is first join DAN at \$15 per year and for an additional \$25 one receives -- a \$15,000 emergency coverage policy with

a 5% deductible.

The DAN policy offers worldwide coverage up to \$15,000 for treatment of decompression sickness, air embolism and pulmonary barotrauma. This includes: air ambulance service; treatment at hospital or non-hospital based chamber; inpatient hospital care (room, board, nursing care, intensive care; service and supplies); physician and other personnel fees (diagnostic X-ray, laboratory services, physiotherapy, oxygen and oxygen equipment rental). That's a lot of coverage for \$25.

Many health policies offered through employers won't pick up all the costs of air ambulance evacuation or diver accidents, but DAN will step in and pick up as much as \$15,000 of the uncovered costs. Even if you never leave the country, short air hops to a chamber can quickly approach \$1,000.

Just how good is this policy? DAN provided the following comparison of competing insurance plans.

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Company	Air Ambulance	Hyperbaric Treatment	Deductible	Premium
Equitable	yes	yes	\$2,000	\$372/yr
SOS Internat	yes	no	\$ 100	\$ 15/wk
Air Access America	yes	yes	\$ 50	\$ 52+ /wk
DAN (Provident)	yes	yes	5%	\$ 25/yr

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We commend DAN and Assistant Director Chris Wachholz for the hard work they have put into this project, but whether DAN is able to maintain the policy will depend upon the base of divers built up. In the first several months DAN has recruited more than 4000. So far so good, but if the insurance is to become a safe diving staple, it will require a much larger number of divers to sign up.

To assist you, we have included an order form with this issue of *Undercurrent*. DAN membership itself is a good thing, since it supports research into diving sickness, as well as 24-hour telephone access to physi-



cians who will find an air ambulance for injured divers while providing treatment advice to doctors and chambers anywhere in the world. If you're much of a diver, especially one who travels abroad to dive, you need the insurance.

Pass a copy of the application along to a diving friend. And dive shops and dive clubs might send their customer/membership lists to DAN so that they

can mail information directly to the divers. Any club or shop newsletters that desire artwork for articles on the DAN program can receive it, free of charge.

For additional applications, write Chris Wachholz, Assistant Director, Divers Alert Network, Box 3823, Duke University Medical Center, Durham, North Carolina 27710. The phone number is 919/684-2948.

## Diving -- And Being Very Male

### -- An Ugly Feeling

As an ardent reader of the "About Men" feature in the *New York Times Magazine*, I was pleased not long ago to see an illustration of divers in the Sunday feature and quickly read the column. Indeed, it was a curious story. Although it's popular to talk and write about the "macho" diver, there's not much written about the true essence of the male diver. This piece, by Sam Toperoff, gave a new spin to the story. Toperoff is a novelist and journalist; his latest book is *Sugar Ray Leonard and Other Noble Warriors*.

--Ben Davison, editor

Not long ago, I had the chance to work for several months on an archaeological salvage ship looking for a sunken Spanish galleon. I had never even snorkeled before, but I soon became, at the age of 53, one of the ship's regular divers. My wife and daughter had encouraged me to try it. "Chance of a lifetime," they said.

To say the least, their generosity lent a certain irony to an ugly feeling that came over me after I had a close call while "hard hat" diving.

"Hard hat" is the jargon term for "surface air supply" diving. The hard hatter wears a weighted fiberglass helmet connected to a compressor on deck sending air down to him through an "umbilical." There is radio communication through the helmet with the diving supervisor. On this particular dive, he was Alan J. (Nutty) Carr, a very precise Englishman with 20 years of Royal Navy diving experience.

For added safety, we dived in pairs. Jumnian Ruenrawat, a Thai, the ship's first mate, and I "buddied" regularly. Even though language was an impediment, we were *sympa* enough to trust each other deeply.

We had been sent down to excavate coral boulders from an area in which 17th-century cannonballs had been found -- a sign we were closing in on the galleon itself. Working at 45 feet, shallow water on this project, we normally performed 75-minute shifts, well within prescribed limits for the depth. That's why I was somewhat surprised when, after only 40 minutes, Nutty's voice broke the rhythmic gurgle of our underwater breathing. "Sam. Jumnian. Please pro-

ceed to your downline."

My reaction was not panic. Just the reverse, I felt the fluttery excitement of a challenge I was certain I could meet. Like a final exam I knew I'd ace. Glad to be tested, I concerned myself first with Jumnian. I wasn't sure he had understood Nutty's instruction. When I got his attention, it was clear he knew something was up, something unusual, something serious. I pointed to the downline, which hung off the stern of the ship and was anchored on the sea bed about 100 feet away.

Nutty's cold voice again: "Proceed immediately to the downline. You are on emergency air."

"Roger, Nutty." An exhilaration came over me. We were far too shallow for it to be "rapture of the deep." It must have been the thrill of true adventure.

The current was very strong against us. We handled that as always by getting low to the sea floor and half crawling, half falling forward toward the line. Above, I could see the sun glittering on the surface and the umbilicals being hauled in steadily. Things were happening fast; I saw them at half speed.

"Nutty. We are at the downline."

"Be sure your umbilicals are clear. Come up immediately."

I gestured Jumnian up first. He simply repeated my invitation to climb. Alphonse/Gaston. No, no, I insisted, then backed a little way off the line to be sure our cords didn't foul. Jumnian went up the line a little faster than the suggested ascent speed of one foot a second. I realized I was carrying the crowbar I had been using. I hefted myself and the tool up the rope, struggling a bit. On deck, the tenders unscrewed my helmet quickly and pulled off my weight belt.

Our main compressor had been down with electrical problems, and its diesel backup had sprung an oil leak. A passing crew member noticed it and told Nutty, who had the presence of mind to switch quickly to a contingency bottled-air hookup. No problem, after it cut in and we acted surely and swiftly.

Although there were brisk nods and thumbs turned



up in our direction, no fuss was made on deck about our experience. It was as if true professionals handled these things matter-of-factly all the time. I, too, played it low-key, walking about the deck with uncommon ease.

It wasn't until I was alone in my cabin that the throb of excessive excitement came -- and with it, two distinct sensations. There was great pride in having responded precisely, in having done what I was supposed to do. Then there was the pure thrill of having been pushed to the edge of danger and having pulled myself back to safety.

That should have been an end to it -- an adrenalin high. But it wasn't. Another feeling, powerful and unpleasant, began to build. I recognized the metallic taste or arrogance. I began to feel superior, after all, even to the sea itself, if you can believe that. Absurd, I realized even then, but powerful nonetheless. It was like so many triumphant moments I'd seen by athletes on television: the exhilaration of victory accompanied by a mean-spirited disdain for the loser. Fist thrust into the air, a sneer instead of the gracious winner's smile.

But who or what could have been "the loser" in my adventure? To my amazement, my triumphant sneer was directed at the sort of life and value system

I had chosen for the last three decades. It came as a smug disgust with my role as husband and father, with having shared equitably, as an enlightened man, all the burdens of family life with my hard-working wife and daughter. A voice in me was saying, much to my dismay, "I am No. 1 ...the hell with small, day-to-day decencies."

I gave no thought to the fact that two of the salvage ship's finest scuba divers were women. Here on this ship, I told myself, I was living a man's life. My danger was a man's danger. Women! What the hell did they know about going to the brink? About grace under pressure?

The emotional upheaval lasted only a few minutes, but I can recall the feelings precisely. I've described them to a few men and women, and they've said I make too much of an isolated sexist outburst. It was, they explain, merely a distortion produced by an extremely emotional exhilaration. They're wrong, of course. They've explained the distortion; they haven't explained why I somehow needed to make women, as a class, the defeated foes of my triumph. Why women, and not the fates or death itself? I have written this because I truly wish to understand, and often do after I form words on paper. But that has not happened.

## The Risks Of Sport Diving: Part II

### -- Is Diving Getting Safer?

In the last issue of *Undercurrent*, Robert Monaghan, a NAUI and PADI instructor with doctoral training in statistical modeling, argued that the

active diver population numbers approximate 700,000. This contrasts with estimates of the National Underwater Accident Data Center which

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### Equipment Problems Questionnaire

So that *Undercurrent* can continue to remain on top of problems occurring with diving equipment, we are including this brief questionnaire to help you inform us about any problem with your diving gear that might need attention by the manufacturer.

Too often individual problems go unreported. Your assistance will help us see that we can uncover any shortcomings in specific pieces of equipment before they create problems for others.

1. What piece of equipment has had a problem: \_\_\_\_\_
2. Brand \_\_\_\_\_ Model # \_\_\_\_\_
3. Year purchased \_\_\_\_\_ Bought new [  ] used [  ]
4. Number of dives using that piece of equipment \_\_\_\_\_

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claims there are more than 3,000,000 active divers, a figure which most people in the industry accept and rely on.

In this issue, Monaghan continues his analysis, focusing on what those figures might mean in terms of the safety of diving.

### Just How "Active" Is "Active"

In the last issue I noted that NUADC defines active diver as someone who makes "at least three dives" annually. It seems quite a stretch to consider a person making so few dives as "active," but that's become the acceptable industry definition.

The NUADC figures which show that diving is getting safer are based on a growth in the number of divers. But today's divers are apparently making far fewer dives than did their counterparts in the mid-1970's, when diving was the central recreational aspect of most divers' lives. Today, diving is more of a family sport. More women are involved. And a much higher percentage of divers do their diving on one vacation a year, rather than on weekends near their home. The result is that typical divers today make far fewer dives than did divers ten years ago.

In fact, the typical diver today may be making 40% -- or even 65% -- fewer dives per year than ten years ago.

*Skin Diver* magazine annually surveys its readers. In the 1970s, their survey found that each subscriber went diving an average of 25.4 times per year. ("Times" is a day of diving, which *Skin Diver* has determined statistically to be about 2.1 dives, or roughly 53 tanks per year.) By 1980, that figure had declined to 19.1 times (A 1980 *Sport Diver* survey had a figure of 15.1, and the 1981 *DEMA Report*,

prepared by the independent Harvey Research Organization, came up with a figure of 8.7 times per year). In 1983, *Skin Diver* subscribers reported that they spent an average of 15 days diving. The 1985 report doesn't report a number for the average number of diving days.

Granted, the nature of the typical *Skin Diver* reader could have changed dramatically in those ten years, leading to invalid data. On the other hand, this drop in average number of dives seems to make sense. Where ten years ago, about the only diving most people could afford would be diving in their home state, today hundreds of thousands of people of all ages have been certified (a high percentage at tropical destinations) solely for the purpose of diving on vacation. With great numbers of older people and vacationers being certified, it is no wonder that the drop out rates remain high and the average number of dives has dropped substantially.

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*"The conclusion here is quite fascinating: 700,000 active divers seem to be making about 40% (and perhaps even 65%) fewer dives than did their counterparts ten years ago."*

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So, the conclusion here is quite fascinating: 700,000 active divers seem to be making about 40% (and perhaps even 65%) fewer dives than did their counterparts ten years ago.

With annual experience down from 25 to 15 days of diving (or to 8 days, if we use the *Harvey* report) today's typical diver is significantly less experienced than was his counterpart ten years ago.

And where the typical diver ten years ago was more

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5. What was the problem? (Be as specific as possible)

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6. Were you or anyone else injured because of the problem? Yes[  ] No[  ]

7. If so, please describe the injury

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Name \_\_\_\_\_ Business phone \_\_\_\_\_ Home phone \_\_\_\_\_

Address \_\_\_\_\_

Return to Ben Davison, *Undercurrent*, P.O. Box 1658, Sausalito, CA 94966



likely to brave the more difficult waters of California or the Great Lakes or elsewhere, the percentage of total dives being made in those waters today has declined markedly.

If one wishes to argue that today's less experienced divers are safer divers, it is only because an increased percentage of dives being taken are in warm and clear tropical waters with divemasters or guides present.

It is the dramatic change in the number of dives per individual and the conditions under which they are being conducted which have helped the actual number of annual deaths to decline since 1976.

Even so, the fatality rate is not as low some people claim.

### Unreported Deaths – A Minimum Estimate

The NUADC has itself estimated that during the 1970's there might be up to 10 unreported deaths each year in the U.S. and we can accept that. Furthermore, we would argue that the number of deaths of American divers in foreign waters is also reported inaccurately.

The NUADC data collection system is not adequate for accurately determining diver deaths abroad. Although the NUADC director, John McAniff has written to *Undercurrent* that he has "10,000 contacts who are solicited for information by mail at a rate of about 1000 letters, three or four times per year," certification agencies, resorts, the travel agents, foreign governments don't systematically report deaths to NUADC. And U.S. newspapers, from which NUADC receives 75% of its death notices, don't report all foreign deaths (injuries and deaths in Mexico are notoriously under-reported). With no formal reporting system, NUADC must rely upon voluntary reports, mainly from unofficial sources. NUADC, with limited resources, does the best it can to collect these statistics, but we must expect foreign deaths to be seriously underreported and that gap will increase as diving travel increases.

Nevertheless, we'll simply accept that notion that the reported fatality figures are about 10% short of reality.

NUADC charts show 532 deaths of American divers in a five year period: 482 in the U.S., 31 in the Caribbean and 19 in the rest of the world. For the purpose of this analysis, we'll kick that up 10% to 585, or 117 per year.

### Has Diving Gotten Safer?

We can now take a closer look at claims that diving has gotten safer.

In 1976 the number of deaths peaked at 147. We have shown that there were roughly 25.4 days of diving per diver per year times 2.1 dives per day, or more than 53 dives per diver per year. That figure suggests

about 26 million dives overall for that year.

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*"If one wishes to persist with the belief that diving is getting safer, one must acknowledge that it is only because it is increasingly being conducted in warmer tropical waters under carefully controlled circumstances. It would be difficult to make the case that it is due to better training or greater experience."*

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The ratio of deaths in 1983 (the last year for which we have participation statistics) to 1976 is 110:147, that is, 1983 had 25% fewer deaths than 1976. But, as we have shown earlier, divers are making far fewer dives. 15 million in 1983 to 24 million in 1976, or 38% fewer. If each of today's dives were as safe as those of 1976, we'd expect a 38% reduction in the number of deaths from 1976 -- or 91 deaths. Yet we reported 110 deaths. Analysis of other years will show some ratios about equal, which still does not permit the argument that diving is getting safer. Yet, if one wishes to persist with the belief that diving is getting safer, one must acknowledge that it is only because it is increasingly being conducted in warmer tropical waters under carefully controlled circumstances.

It would be difficult to make the case that it is due to better training or greater experience.

### Risk Assessment

We can make our own risk estimates using the number of estimated total diving deaths of 117 and the predicted number of 700,000 real divers. Using our figures, the rate of death among those real divers is 16.7 deaths per 100,000 divers (117/700,000).

The risk of death would be 117 deaths/11,000,000 dives, or 0.0011% deaths per dive. Taking the reciprocal, we get an estimate of one death per 95,000 dives. Even in the peak death year, 1976, it was more like one death per 132,000 dives. Keep in mind today's average diver only dives 15 dives per year.

### Perspectives From Other Sports And Activities

For years, we've been told diving is a safe sport, but how does it really stack up against the others. The 109 deaths NUADC reported in 1980 are 6.4% of the 1,730 recorded U.S. 1980 deaths in all sports, including hang-gliding and parachuting.

The fatality rate of all listed sports is under 1.88 deaths per 100,000 participants. "Safe" sports like football, basketball, waterskiing, and snowmobiling average only 0.22 deaths per 100,000 participants. Diving, with 16.7 deaths per 100,000 participants, is 75 times more dangerous than these "safe" sports.

For example, if we add all the 1980 deaths of football, basketball, waterskiing, and snowmobiling par-



there were 53 million participants in those "safe" sports! Furthermore, if we consider how few hours a diver is actually underwater when compared to the hours a participant is engaged in the other sports, the ratio is even more dramatic.

In comparison with the high risk sports like parachuting or hang-gliding, diving is safer: there are two-fifths as many deaths on a per 100,000 basis compared to hang-gliding, and one-fifth as many compared to parachuting. Diving also seems to have a much lower injury rate.

Death Rate Per 100,000 Participants	
SPORT	RATE
PARACHUTING	82.90
HANG GLIDING	43.30
SCUBA DIVING	16.70
BOXING	12.50
SWIMMING	2.44
BOATING	2.36
SNOWMOBILING	0.70
WATER SKIING	0.26
FOOTBALL	0.25
BASKETBALL	0.02

The source for the nonscuba data is the 1984 Accident Facts -- National Safety Council.)

Some divers are fond of saying that diving is as safe as driving a car. This, of course, is nonsense. Yes, there are fewer deaths per 100,000 divers than 100,000 drivers (16.7 diving deaths versus 19.3 vehicle deaths according to 1984 Census data), but a typical diver conducting 15.1 hour-long dives logs about 32 hours a year underwater, only a tiny fraction of the time that a typical driver puts in behind the wheel.

### Why Do We Cling To Erroneous Statistics?

The estimates we have developed here clearly conflict with those commonly used in the industry. In general, we find that there are fewer divers, fewer dives, and greater risk of fatalities.

Why does the industry use erroneous statistics? There are no others.

The only organization collecting this data, NUADC, has a minimal budget and can't be expected to locate fully accurate fatality statistics.

NUADC must accept certification data provided by the agencies -- without any distinction of duplicate certification. It can only estimate such figures as "active diver" and the "drop out rate." It has no money to conduct research on its own.

By staying with its standard reporting pattern over the years, NUADC does not look at the data any differently today than it did ten years ago. For example, when NUADC uses a base year to compare current deaths to past ones, they always choose 1976 as the

year for comparison, the year with the highest level of deaths -- 147. If we used the next year, 1977, we'd only have 102 deaths and our current levels wouldn't seem like much of an improvement.

NUADC often issues preliminary statistics, updating them later when all the data is in. The final report inevitably shows more fatalities than the preliminary report. Nonetheless, many people use the preliminary figures and don't update them after NUADC does. For instance, in Nadler's widely quoted article "PADI's Impact on the Diving Industry" (*Undersea Journal*, 3rd Quarter 1984), preliminary figures are used. The rate of 3.63 deaths per 100,000 used by Nadler was raised as much as 15% to 3.89-4.16 deaths per 100,000 when NUADC discovered additional deaths. Of course, we maintain that 16.7 deaths per 100,000 is closer to reality.

Any manufacturer or training agency can cite NUADC figures to insurance companies to demonstrate how safe diving is.

The industry has an interest in presenting a safe image of diving to potential federal, state, or local regulators. A great deal of money is spent to lobby against legislation aimed at regulating diver training. NUADC statistics can be used to convince public officials that the diving industry can regulate itself.

I am not claiming there is collusion in the industry to disseminate erroneous data. I am saying there is no incentive to collect more accurate data. At the time of this writing, no one has been willing to spend the money to do it. It's my hope that this article will lead to accurate determination of the safety of diving -- with subsequent moves by the entire industry -- training agencies, instructors, dive stores, resorts, divemasters, travel agencies, boat captains, manufacturers and anyone I've missed -- to make our sport safer.

*Undercurrent comments:* We published Bob Monaghan's article with the hope that it will lead to sufficient introspection to fund the collection of more accurate data about the safety of diving -- and more cooperation in sharing that data.

Obviously, Monaghan's conclusion that diving is less safe than we have been led to believe can impact all levels of diving, including you, the sport diver.

Yet, we all know that the truth will save lives, most likely by pushing the industry to develop ways to make diving safer. We've all seen newly certified divers come to the Caribbean for their first vacation who are embarrassingly incompetent. We know how much the manufacturers sell regulators by advertising colors, rather than providing information about their capacity to deliver air under difficult conditions.

Yes, the industry does a great deal to stress safety. But it can do much more. It's our hope that this article may provide the impetus. In the long run, inaccurate or incomplete safety statistics are in no one's self interest.