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Small Hope Bay Lodge, Andros, Bahamas

Goombay, repartee, and the Chinese chicken fish

What kind of fool dives to 185 feet? At that depth there are no rewards--fish life is limited, coral has insufficient sunlight to grow, no colors remain--and there are unnecessary risks. What if I get stoned on nitrogen? What if my weight belt falls off and I shoot to the surface? What if my automatic inflator inadvertently fires and I can't disconnect the hose or reach my dump valve cord? I've never tested my regulator at that depth; will it perform? Although Andros is without a recompression chamber, the guides are still taking us "over-the-wall." Thanks, but no thanks. I am not suicidal.

I must admit to feeling a bit proud when divemaster George Fox read aloud the certificate proclaiming my successful descent to 185 feet. The nondivers at dinner applauded my award; the newly arrived divers looked at me respectfully, silently contemplating their own fears. I had thought it melodramatic to award certificates--until it became my turn--and then I found the ceremony capped a splendid dive and a nice stay at Small Hope Bay.

I had been beyond 185 feet before, but it had been awhile, and I had forgotten the unique thrill resulting from the unusual elements of a deep dive; the increased pressure, the euphoria from nitrogen, and the change in light and color. As I descended I could see the grey ledge at 185 ft., and below that I knew the wall dropped to 6,000 ft. As I sank, the lightness of my head and the heaviness of my body exhilarated me beyond the experiences of the 9-5 urban hustle. I felt immersed in challenge; surely a challenge minor to a professional diver, but major and supremely thrilling to a sport diver like me. And as I sit here now, earning a buck while I wait for winter to end, the experience lingers. There are few days in my life when I extend myself beyond the limits of caution and reap the rewards. It's nice to get a real kick now and then.

INSIDE UNDERCURRENT

The over-the-wall dive at Small Hope Bay is a biweekly event, not widely publicized in a safety-conscious travel industry catering to inexperienced and ill-prepared divers. Not everyone who visits Small Hope is permitted on this dive and many divers never even ask. My buddy had not been to such a depth before, but guide Brendal Stevens firmly grasped her hand and gently led her down and back. She wouldn't have missed it for the world. And she will never forget the chinese chicken fish, which can be observed only by the few divers who go over-the-wall.

Diving begins at Small Hope with a mandatory checkout at 10 ft. where each diver must disassemble and reassemble both mask and regulator. Thereafter any successful diver can proceed. Although three nondivers took resort courses, two couldn't complete their first dives and one refused to return to the water. Brendal Stevens, the otherwise competent divemaster, did not provide enough assistance for novices. I suspect the staff at Small Hope prefer divers who have filled a few pages in their log books; I also suspect that someone--especially a male--who needs tender-loving-care might be better off starting out elsewhere. On the other hand, George and Brendal are excellent leaders for the experienced. Although bottom times were occasionally set too short, they permitted the freedom of exploration experienced divers demand.

Brendal's serenades and George's repartee make the trips to the reef similar to scenes from Love Boat. They pilot flat-bottom barges (which, when loaded with the full 15 bodies, are too crowded) to an infinite number of good sites along the reef--about 1000+ yards from shore. Snorklers often join the boat for shallow afternoon dives, since the sand bottom off the hotel front offers little of interest.

During my stay I visited seven different sites, and though I did not find the canyons and cuts that I enjoy, I indeed found a bottom with enough variety to satisfy my fickle interest. On one dive the coral pinnacles rising from gardens resembled Tolkien castles and though tropical fish life was limited, a 60-lb. snapper circled above. At another site, at 60 feet, a variety of soft corals swayed in the lazy current; the fish life seemed neither abundant nor unique, but I did follow a beautiful queen trigger and several small groupers, while other divers observed a nurse shark and a small black tip reef shark. Yet at the shallow sites, frequently visited in the afternoons, swarms of tropicals sauntered beneath the racks of staghorn coral, and between waving seafans, providing superb opportunities for natural-light photography. A couple of dozen sizeable groupers hover about a sunken barge in 70 feet of water,where, as your buddy feeds the critters with lunch, provided by the guides, you can snap plenty of photos of 20 pounders sticking their snouts in BC pockets searching for the last tidbit. During my dive on this barge a school of 30 Atlantic spadefish drifted by in formation, indeed a special treat. On the whole, I rate Small Hope Bay among the best in the Bahamas; the diving is good, not spectacular, and, for example, probably a notch below Cayman's north wall or Bonaire.

Being here during the first week of February, however, has its liabilities. Although Bahamas winters aren't exactly Minnesota winters, there are plenty of days when one is far more comfortable sipping hot brandy in front of the fireplace in the Small Hope Lodge than cringing in the breezy outdoors. Before and during my stay, there were brief rains, ominous clouds, and chilling winds. The water temperature ran about 73-75° and only the divers who wore full wet suits emerged comfortably after two dives. Visibility averaged about 80 ft. That's nothing to complain about for most of us, but winter is not the optimal season.

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Small Hope's 20 ranch-style units sit beneath tall pines and coconut palms along a pleasant sandy beach where, when the wind stops, a few sand flies nibble. One must understand that Small Hope is a dive lodge, not a posh resort, and though everything worked, a certain unnecessary carelessness detracted from my generally positive impression. A split in the seam of the bedspread (doubtless the result of someone reveling on the water bed), pitted chrome fixtures, windows translucent from salt spray, soiled carpets, a funky shower stall, and footsteps in my luggage late at night, cooled my otherwise warm feelings. Granted, remote lodges wage a constant struggle to stay on even footing with mother nature; and granted that extra costs are passed along to the vacationer; I would nevertheless prefer dropping a couple of extra bucks each day for the lodge's general upkeep.

A WISE WORD FOR TRAVELERS

Thou shoulds't not expect to find things as thou hast at home, for thou hast left home to find things different.

Thou shalt not take anything too seriously, for a carefree mind is the start of a good holiday.

Thou shalt not let the other travelers get on thy nerves, for thou hast paid good money to enjoy thyself.

Take half as many clothes as thou thinkest and twice the money.

Thou shall not judge the people of a country by the person who has given the most trouble.

from a plaque at the Lake Eacham Hotel
Yungaburra, Australia

Yet in judging Small Hope, one must award high marks to a staff which, from the owner on down, transcends soiled carpets, and makes the operation extraordinary. The convivial divemasters engage the guests in witty conversation, tough backgammon, or sweet song, depending upon time of day. Owner Dick Birch is an excellent host who not only ensures that new guests quickly feel welcome, but also enjoys intelligent chats about the theory of dive instruction or Bahamian politics. His wife Susie adds her special spark when she is not working overtime in her batik business. Alex Blackwell, de-facto manager, commiserated with my buddy and me when we discovered our airline reservations were for a nonexistent flight, and, for a nominal sum, not only flew us to Nassau in the Lodge's twin engine plane, but gave me my first flying lesson in the co-pilot's seat. That's service.

Kitchen and dining room staff were always pleasant and prompt. One morning, when our late slumber nearly caused us to miss the dive, eggs, bacon and pancakes were rushed to the table. Buffet lunches always included at least one hot dish--e.g. grouper in tomato sauce--and plenty of cheeses, cold meats, salads and even peanut butter for a kid like me. Guests helped themselves to the amply-supplied salad bar and soup urn before receiving two dinner choices (lobster or beef, grouper or pork chops, conch or chicken) served at community tables. The meals were hearty, not gourmet; main courses were well-prepared, but the side dishes were not much beyond common restaurant fare. Bartender Mias Johnson was always handy with a smile to mix a devilish Goombay Smash ($2.50) or pop open a Molson's Ale ($1.25).

So, the essence of Small Hope Bay is not the thrill of the 185-foot dive, frets about a funky shower, complaints about a winter wind, or double helpings of lobstertail. For me it was the pleasant combination of people who run the show and who are able to make a guest feel happy he came, no matter what the circumstances. Small Hope Bay has a loyal following and you can bet it's Dick Birch and crew (along with some pretty decent diving) that keeps 'em comin' back.

Dollars and sense: Until September 3, the price is $76/day/double for room and three meals, plus 10% service charge and 3% room tax . Single-tank trips are $14 apiece, including tank (filled to 2400 psi), pack and weights. A one-week dive package permits a small saving. Small sail boats, wind surfing, bicycles and a hot tub (nearly completed) are free diversions. For a fee, one may fish or rent a car or motorbike to tour the island. Guests with reservations will be met at the airport or brought to the Lodge ($3.50/person). Any travel agent can make reservations, or you may call Small Hope directly by dialing (809) 328-2014, or call the toll-free Bahamas reservation number (800) 327-0787. Write to Small Hope Bay Lodge at P.O. Box N1131, Nassau, Bahamas for a brochure; it describes flights from the U.S. or Nassau other than Bahamas Air (the slogan "if you have time to spare fly Bahamas Air" is unfortunately true for flights to the outer islands). Holiday Wings makes round-trip flights from Lauderdale to Andros for $115/person (800) 327-2514. The only plastic accepted at Small Hope is American Express...and bring all the gear you need since there are no sales,and repair capacity is minimal.

Functional Performance of Scuba Regulators

Research by U.C.L.A's Dr. Glen H. Egstrom

Obviously, the most complex link in the scuba diver's life support system is his regulator. The old-fashioned regulators delivered a constant flow of low-pressure air from a high-pressure cylinder. In the next generation the demand valve was integrated into this system allowing the diver to cycle the air from "Flow" during the inhalation to "No Flow" during exhalation. The extended bottom time afforded by this simple change became a significant factor in the rapid growth of sport diving.

Two hose demand regulators were somewhat troublesome because the demand pressure would change significantly depending upon the position of the regulator relative to the chest. If, for example, the regulator was deeper in the water than the diver's chest, he could not breathe as easily. Two hose regulators have gradually been replaced by single hose models with improved inhalation and exhalation characteristics so air flow does not change appreciably with changes in a diver's position.

Today's single hose regulators are generally superior to earlier models because of enlarged exhalation ports, improved inhalation valves and reduced internal friction. Their evolution has been steady and the industry can be proud of its achievements in the continued sophistication of this critical life-support device.

Many divers, however, fail to recognize the need for regular maintenance and calibration of their regulators, and they don't understand the changing breathing characteristics which occur as a result of depth and increased ventilation rates. The following study was conducted to provide clarification of the state-of-the-art in regulator performance so that divers will understand the straightforward limitations of regulators and plan their dives to increase the safety margin. Regulator mechanical malfunction is very rarely found in diving. There are, however, a number of reports in which breathing difficulties have resulted in aborted dives, near misses and fatalities. This report should enable divers to avoid many of these problems by understanding the limits of their regulators.

Theory of Regulator Testing

As our concern for safe and effective diving, within the limitations of available mechanical systems has grown, increasing attention has been directed at the topic of "resistance" in underwater breathing apparatus. In 1956, Lanphier reflected that "at moderate work rates the average diver is reasonably comfortable for considerable periods if the inspiratory and expiratory pressures do not exceed 10-15 cm of water at peak flow. Subjects usually report definite discomfort when pressures rise much above 20 cm of water." This statement has been supported by other research and summarized by S.D. Reimers in a 1974 U.S. Navy report entitled "Proposed Standards for the Evaluation of the Breathing Resistance of Underwater Breathing Apparatus."

Since 1965, the U.S. Navy has required that demand regulators be tested at a tidal volume (i.e., the volume of air in a single breath) of two liters with a breathing rate of 20 breaths per minute. The results of the testing are graded according to depth. Furthermore, Mark Bradley and others recommended in 1970 that continuous positive or negative pressure breathing be limited to + 15 cm of water.

In order to measure the resistance of various apparatus, it is necessary to use a reliable breathing device. Cooper in 1959, compared the respiratory work done against an external resistance by man and by a sine-wave pump. He found that at any given minute volume, the rates of external respiratory work during excercise were similar. It therefore seems justifiable to use a pump to generate the pressure-volume loops for testing regulators.

Methodology

The U.C.L.A. Diving Safety Research Project received support for this study from the office of Sea Grant as well as various manufacturers and other private sources. The study was conducted at U.C.L.A. in the Underwater Kinesiology Laboratory from 1975-1978. The regulators were current models at the time of testing and were randomly selected from shipping stock at the manufacturers' plant or off the shelf in dive shops. If a single regulator was found to be out of adjustment to a degree that the testing results would be invalid, it was replaced.

Five regulators selected from each model were subjected to the following tests:

1) The regulators were cycled at a tidal volume (the amount of air breathed in and out) of three liters at rates of 6, 15, and 30 breaths per minute.
2) The regulators were cycled at depths of 0, 10, 20, 40, and 60 meters, both wet and dry.

During the cycling, a pressure transducer connected to an x-y plotter was used to record the performance of the regulator during the full inhalation/exhalation cycle. The transducer measured the differential pressure at all points in the cycling. The results were fed into a computer to obtain the data reduction necessary to interpret the tests.

The breathing rates of 6, 15, and 30 cycles were selected to give a range from normal to excessive. Although 30 cycles at 3 liters is not a realistic human expectation, it was used to provide an extreme measure of regulator performance. Observations of experienced divers revealed that it was common practice to breathe at rates slower than the 12-18 breaths commonly found at rest on the surface. Divers prolong the inhalation and exhalation portion of the cycle which permits a fuller exchange at a lower flow rate. This latter factor becomes increasingly important as our data will show.

"When tank pressure drops, the flow through the tank valve opening or the inlet port to the first stage will be reduced dramatically."

This prolonged exchange should not be confused with skip breathing. In skip breathing a diver holds his breath at the end of the inhalation portion of the breathing cycle. In the pattern we observed, the exhalation began immediately after the inhalation. The significance of this slow cycle, low peak flow rate breathing pattern assumes perspective when we recognize that the peak flow rate during any breathing cycle puts the greatest strain on the regulator link of the life support system. As an example, a person working hard on the surface could have a minute volume (amount of air breathed in one minute) of 100-120 liters per minute with peak flow rates within a given breathing cycle in the range of 300 to 350 liters per minute. Thus, in order to average 100-120 liters per minute, the individual must force the peak flows much higher due to the reduced flow during the early and late portions of the inhalation and exhalation process.

When divers speak of "over breathing" a regulator, they usually mean that the regulator becomes harder to breathe during the peak flow periods. This usually occurs when trying to get more air through a restricted orifice. If we were to breathe through a small bore snorkel, we could demonstrate the problem. Breathing slowly and deeply would be relatively easy. But *doubling* the flow of air through the tube would require four times the energy. Doubling the flow, therefore, does not double the work. It *cubes* the work.

"If the demand for flow increases as a result of rising panic or stress, the diver, in his attempt to get more air than the valve can deliver, will erroneously believe the air supply has run out."

A second consideration relates to flow through an orifice as a function of pressure. For example, when tank pressure drops, the flow through the tank valve opening or the inlet port to the first stage will be reduced dramatically. If the diver's demand for air then exceeds the flow capability, he requires a large increase in inhalation effort, a situation which commonly exists when a diver's tank pressures reaches 300 psi and he tries to draw more air from the regulator. The harder the diver sucks on the regulator, the greater the resistance to flow becomes. If the demand for flow increases as a result of rising panic or stress, the diver, in his attempt to get more air than the valve can deliver, erroneously will believe the air supply has run out. On the other hand, if the diver can maintain a low peak flow breathing profile, it should be possible to breathe with relative comfort and make a safe ascent.

Results

As indicated previously, differential pressure is an effective yardstick for Scuba regulator performance. A regulator operates at an *acceptable* level when the differential pressure during inhalation or exhalation is less than 15 cm of water. I will also classify regulator performance as *marginal* if the regulator exhibits from 15-25 cm differential pressure and *excessive* if the regulator exhibits greater than 25 cm of water differential pressure.

We tested five regulators of each model at both 300 and 1200 psi tank supply pressure. From these figures we can get a good idea how each regulator model functions at high (1200 psi) and low (300 psi) tank pressure at the surface, and at depths of 10, 20, 40, and 60 meters. The breathing rate is fixed at 15 breaths per minute and the tidal volume is fixed at 3 liters. This corresponds to a *moderately working diver*.

At 0 meters depth (surface) we can see that all of the regulator models tested showed a mean differential pressure in the acceptable region (less than 15 cm differential pressure) both at high and low tank pressures when observed at the surface.

At 10 meters depth the differential pressures are slightly higher but still generally within the "acceptable" region. Only a slight difference exists between

	Surface 1200 psi	Surface 300 psi	10 M 1200 psi	10 M 300 psi	20 M 1200 psi	20 M 300 psi	40 M 1200 psi	40 M 300 psi	60 M 1200 psi	60 M 300 psi
DACOR 100	●	●	●	●	●	○	◐	○	○	○
DACOR 200	●	●	●	●	●	●	◐	○	○	○
DACOR 400	●	●	●	●	●	●	●	○	●	○
DACOR 800	●	●	●	●	●	◐	◐	○	◐	○
HEALTHWAYS 1668	●	●	●	●	●	◐	●	○	◐	○
HEALTHWAYS 1675	●	●	●	●	●	●	●	○	●	○
HEALTHWAYS 1677	●	●	●	●	●	●	●	○	◐	○
HEALTHWAYS 1682	●	●	●	●	●	●	●	○	◐	○
HEALTHWAYS 1685	●	●	●	●	●	●	◐	○	○	○
POSEIDON CYCLON 300	●	●	●	●	●	○	●	○	◐	○
SCUBAPRO MARK 1	●	●	●	●	●	●	●	○	●	○
SCUBAPRO MARK 2	●	●	●	●	●	●	●	○	◐	○
SCUBAPRO MARK 3	●	●	●	●	●	●	●	○	◐	○
SCUBAPRO MARK 5	●	●	●	●	●	●	●	○	●	○
SCUBAPRO PILOT-PREDIVE	●	●	●	●	●	●	●	◐	●	○
SCUBAPRO MARK 5 PILOT-DIVE	●	●	●	●	●	●	●	●	●	○
SCUBAPRO MARK 7	●	●	●	●	●	●	●	○+	●	○
SHERWOOD SRB 3000	●	●	●	●	●	◐	◐	○	○	○
SHERWOOD SRB 4100K	●	●	●	●	●	●	●	○+	◐	○
SPORTWAYS 5	●	●	●	●	●	◐	◐	○	○	○
SPORTWAYS 200	●	●	●	●	●	●	◐	○+	○	○+
SPORTWAYS 300	●	●	●	●	●	●	●	○	○	○
SPORTWAYS 500	●	●	●	●	●	●	○	○	○	○
SPORTWAYS 750	●	●	●	●	●	●	●	○	○	○
SUB AQUATIC SYSTEM 2096	●	●	●	●	●	●	●	○	◐	○
SUB AQUATIC SYSTEM 2097	●	●	●	●	●	●	●	○	◐	○
US DIVERS CONSHELF 12 1081-00	●	●	●	●	●	●	●	○+	●	○
US DIVERS 1083-00	●	●	●	●	●	●	●	○	●	○
US DIVERS CALYPSO 4 1084-00	●	●	●	●	●	●	●	○	●	○
US DIVERS 1086-00	●	●	●	●	●	◐	●	○	◐	○
VOIT MR-12	●	●	●	●	●	●	●	○+	●	○
VOIT R14	●	●	●	●	●	●	◐	○	○	○
VOIT V122	●	●	●	●	●	●	◐	○	○	○
VOIT V124	●	●	●	●	●	●	●	○	●	○
WHITE STAG DEEP 3(51110)	●	●	●	●	●	●	●	◐	◐	○
WHITE STAG 51140	●	●	●	●	●	◐	●	○	◐	○
WHITE STAG 51141	●	●	●	◐	◐	◐	○	○	○	○
WHITE STAG 51440	●	●	●	●	◐	◐	◐	○	○	○
TEKNA 2100	●	●	●	●	●	●	●	●	●	○+

This chart indicates the average test results of five regulators of each model tested under conditions considered to be those of a "moderately working diver." (See the text for a specific definition of the test parameters.) The regulators were tested under five simulated depths—the surface, 10 meters (33 feet), 20 meters (66 feet), 40 meters (131 feet) and 60 meters (197 feet). At each depth they were tested at two different tank supply pressures, 1,200 psi and 300 psi. A solid circle (●) indicates the regulator's performance was acceptable (less than 15 cm of water differential pressure), that is the effort required for a moderately working diver to get air was "acceptable." A semicircle (◐) indicates the regulator's performance was marginal (between 15-25 cm of water differential pressure). An empty circle (O) indicates the regulator's performance was excessive (more than 25 cm of water differential pressure), that is a moderately working diver would require an excessive effort to breathe and may therefore have difficulty getting air under the designated circumstances. A plus (+) in the 40 or 60 meter column indicates that the regulator, although requiring excessive effort to breathe, performed substantially better than the other regulators judged "excessive."

the high and low tank pressure tests.

At 20 meters depth, the high pressure tests, with three exceptions, are still within the acceptable region.

At 40 meters depth, about 2/3 of the regulator models still operate within the acceptable region with 120 psi supply pressure. Ten models are in the "marginal" region and two are in the "excessive" region. With the 300 psi tank supply pressure only a few models did not show "off-scale" differential pressure (50 cm of water) on all five trials. Still, the mean differential pressure on all regulators (except the Scubapro Pilot and the Tekna 2100) were in the "excessive' region. The Scubapro pilot showed "acceptable" differential pressure when in the "dive" mode and "marginal" differential pressures in the "predive" mode. *This chart readily points out the danger of diving with low tank pressure at depth.*

At 60 meters depth, thirteen regulators were judged acceptable, thirteen were in the marginal region, and thirteen fell into the excessive category. (Of these, seven showed off-scale readings for all five regulators tested.) *With the low supply pressure all but two of the regulators tested were off-scale.* This chart points out the need for a diver to realize that Scuba regulator performance decreases with depth, even at high tank pressure. And that at 60 meters depth all regulators tested become excessively hard to breathe at low (300 psi) tank pressure.

The author of this study, Glen H.Egstrom, Ph.D., is professor of Kinesiology at UCLA. A scuba diver since 1954, Egstrom has been Diving Safety Control Officer at UCLA for 15 years and has served as president of NAUI and the Los Angles County Underwater Instructors. In addition to this study, Egstrom is conducting additional research on equipment and underwater safety, as he has throughout his university tenure. He has also served as consultant to many companies in the diving industry. The original version of this study first appeared in the Proceeding of NAUI's IQ 10 and is reprinted, with changes approved by Dr. Egstrom, with the permission of NAUI.

What you have always wanted to know but been afraid to ask

Mary Newberger Korn, M.D., in *Decompress,* the newsletter of the San Francisco Bay chapter of the Sierra Club, discusses several aspects of divers reflex, similar to those discussed in the January issue of *Undercurrent.* Dr. Korn, however, solves one mystery which we once attributed to too much hot coffee.

When underwater, there is greater pressure than when on the surface and this pressure compresses the body's small veins, forcing blood into general circulation. This fools the body into believing that its fluid is excessive, so the body acts to get rid of the excessive fluid. That's why you always have to pee right after a dive.

Or, for that matter, during.

Navy Decompression Studies

The tables work...for some bodies

Ask one beginning diver about the validity of the Navy tables and you're likely to hear him say that 5 percent of the divers who follow the tables end up getting bent. Ask another novice the same question and you'll hear about the margin of error built into the tables which permits a diver to fudge a bit without running into trouble.

Well, fact is that 1/10 of one percent of the U.S. Navy divers who follow the tables do indeed get bent, according to research results from the Naval Submarine Medical Research Laboratory in Groton, Connecticut. Although 97 percent of the Navy dives are to depths shallower than 150 feet, most cases of decompression sickness occured in deeper dives; in fact, the incidence of bends was ten times greater below 150 feet. Navy researchers were interested in whether "pushing the tables" increased the likelihood of bends, and analyzed 6,600 of these deep dives for clues about why some divers got bent and others didn't.

The Navy Diving Manual, as any certified diver should know, instructs the diver to select the schedule depth *equal to or greater than* the depth to which the dive was actually conducted. It also advises the diver to take the next longer decompression schedule if he becomes exceptionally cold or if the work load is relatively strenuous.

But at the Naval Diving and Salvage School, divers are taught an even more conservative rule called the "2 or 2" rule: *If the dive is within 2 feet or 2 minutes of the appropriate schedule, the next deeper or longer schedule should be used.* To sport divers, this rule can be simply interpreted as *"don't push the tables."*

In studying whether pushing the tables affected susceptibility to bends, the researchers found that in most cases of decompression sickness, divers did approach the table limits. But that was true for most dives, whether the diver returned safely or got bent. They found no statistical difference in the incidence of bends between divers who pushed the tables and those who did not. The Navy schedules, when used correctly, work very well, they concluded.

Pregnant Women: At Risk On Any Dive

In response to our article, Should Pregnant Women Dive? (October, 1978), in which we reported on research at Texas A&M., Dr. William P. Fife, one of the researchers, has written:

"I am very uneasy over the now frequently stated conclusion that a woman who believes she is pregnant should limit her dives to 60 feet or less. Actually, our studies showed that a 60-foot dive produced a few bubbles in the sheep fetus. While we classified them as threshold bends, the bubbles were clearly present.

The 60-foot dive had a bottom time of 90 minutes, longer than a no-decompression dive for humans. However, the adult sheep is more resistant to bends than the adult human. A safe dive for a sheep fetus may not be safe for a human fetus.

Several of the sheep aborted or delivered within 12-24 hours after a dive in which the fetus developed bends (which were treated). We do not know if these bends caused miscarriage or early delivery. And, there are many other unanswered questions.

Some women have dived while pregnant and later had what seemed to be normal children. Now some obstetricians and pediatricians are a bit uneasy about this because they feel that subtle mental damage may not be detected until the child enters school or has a professional evaluation. The mother may not be qualified to make such a judgment.

I have often made relatively shallow dives with women in their 6th or 7th month. However, after hearing and seeing the massive lethal bubbles in sheep fetuses after a 100-foot, 25-minute dive, I am frightened. For now, I think that a 60-foot dive is probably not safe and a number of qualified people who have reviewed our results conclude that until we are better informed, pregnant women should not dive. I know this will be a tough thing to hear, particularly if they have been looking forward to a vacation diving. But right now it seems to me that for their unborn children diving is too much like Russian roulette.

I hope the future studies we are planning will make it possible to say that pregnant women can dive to some safe depth without endangering the fetus."

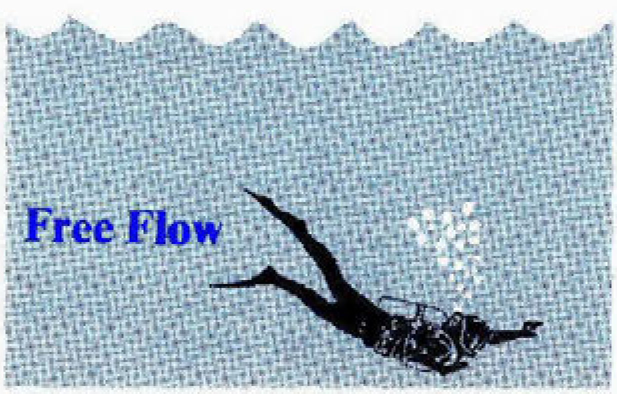
Furthermore, they determined that most of the time decompression sickness is related to other factors besides the dive/decompression profile. "We already have scientific evidence that some divers are more susceptible to decompression sickness than others...these differences in susceptibility...could be related to factors such as age, physical condition, anatomical patterns of small blood vessels, or sensitivity of the body's chemistry to stress." The researchers' conclusion does not take into account work load, water temperature or other factors which also contribute to the bends.

The conclusion for sport divers is twofold. First, although "pushing the tables" does not seem to increase the likelihood of bends for Navy divers, *sport divers who wear uncalibrated depth gauges or rely on others for time checks may inadvertently exceed the tables.* The more a diver pushes or exceeds the tables, the more likely he is to get bent.

Second, physiological factors play a significant role in bends. Each year a number of divers who get bent say they stayed within the tables, but still felt a mysterious and sometimes serious hit. It was probably because of the unique mix of their own physiology, the diving environment, and the dive profile.

Curiously, the researchers found that in more than 1 percent of deep dives, Navy divers exceeded the tables without proper decompression. Although those figures may be only an error in reporting, they do suggest that the mere *knowledge* of safe diving practices is not enough to guarantee a safe dive.

We see no need for a sermon. For a sport diver the lesson should be clear.



If you don't carry a canoe on your sailboat, as did Gerald Brady, and can't paddle it ten miles, as did Gerald Brady, then don't let your boat sink as did Gerald Brady. In fact, you had better secure your tanks with a foolproof method, as Gerald Brady did *not*, because if your boat hits a wave, as did Brady's boat, and the tank falls, as Brady's did, and the valve snaps off, as did Brady's, then the tank can shoot through the hull of your boat. As did Brady's. No wonder life guards had to treat him for shock after they found him floating off the coast of Los Angeles last month.