Accidents and Incidents

Learning from the mistakes of others

The National Underwater Accident Data Center in Rhode Island began tracking recreational scuba fatalities in 1970. In 1989 they joined forces with the Divers Alert Network. During this 24 years of record keeping, there were 2,485 scuba fatalities among U.S. citizens, an average of 104 deaths per year. Over the last 10 years this figure has dropped to an average of 85 per year. In 1993 there were 92 scuba fatalities. Although the report has not yet been released, the preliminary figure for 1994 is 104.

From time to time we report on case studies of divers' deaths so that we may all learn from them. The cases cited here come from an analysis of 1993 deaths by the Divers Alert Network. DAN has found that some factors occur repeatedly:

- Inadequate training or experience
- Equipment inadequacies
- Equipment misuse
- Equipment defects
- Environment
- Current
- Overhead barriers
- Visibility

Identifiable host factors include

- Age
- Pre-existing disease
- Physical fitness
- Alcohol or drugs

Frequently, the reports DAN receives mention the use of prescribed drugs, recreational drugs, or alcohol. When the comments are not documented, they are not included in the data, so the influence of these substances on dive fatalities is uncertain. Furthermore, many therapeutic agents have adverse side effects that may be intensified by diving.

While the facts are edited from DAN's reports, the commentary is solely our responsibility.

Decompression Illness

The term "decompression illness" includes decompression sickness (DCS) and arterial gas embolism (AGE). Both are characterized by the presence of bubbles; a pressure change is required to produce either one; and treatment of the two diseases is similar. Only one of 69 autopsied deaths was clearly due to DCS, while seven were due to embolism. DCS can produce catastrophic injury, but an embolism is more likely to be fatal.

Inexperienced divers are the most likely to embolize and need to understand their limitations. DAN notes that the term "advanced open-water diver" should not be applied to the diver who has completed only a few dives after initial certification. It implies greater knowledge and skill than the diver may actually possess. Having dived often with people who touted their advanced PADI cards, I think that DAN is being kind.

Air Embolism

A 43-year-old man was making his second open-water dive in training, and was beginning to ascend. He lost his weight belt at about 15 feet and ascended quickly. At the surface he became unconscious, a bloody froth coming from his airway. Death came rapidly, despite attempts at resuscitation. While the death was apparently caused by air embolism, it could have been due in part to the victim's extensive cardiovascular disease and the many medications he took, contraindications to scuba diving.

A 325-pound, 50-year-old man was in tropical water with no current at 15 feet. He indicated to his companion that he needed to surface. At the surface he said he was "very tired," then became unconscious. His heart stopped immediately, and attempts to resuscitate him were unsuccessful.

Diving around oil rigs, a 52-year-old diver made a rapid ascent for unknown reasons. On the surface he was in trouble immediately and was unconscious when rescued. CPR was unsuccessful. Although he had died of an embolism, he was found to have had significant coronary obstruction. His depth gauge indicated he had reached 170 feet.

A 41-year-old experienced diver slipped from the edge of a rocky cove while dressing and fell into the water without his fins and without a regulator in his mouth. He screamed for help and went under. (Apparently he was able to place the regulator in his mouth under water.) His body was recovered by lifeguards within 30 minutes. An autopsy found large amounts of air in his heart and aorta.

An inexperienced 32-year-old man was diving from a private boat with friends. He indicated to his buddy that his air was low,

then apparently made a breathhold ascent. He was in cardiac arrest when he arrived at the surface. CPR was administered without success.

In the one DCS case, a 34-year-old man was solo diving from his boat while a companion remained topside. He made two 30-minute dives to 80 feet, at least an hour apart. At the end of the second dive, he passed his equipment into the boat, climbed in, and told his companion that he didn't feel well. The companion reported noisy respiration and moaning, followed by quiet; he thought the diver had fallen asleep, but then found him unresponsive. Unable to operate the radio and unfamiliar with boat operation, it took him two hours to get to land. He ran the boat up on the beach and got help, but the victim had been dead for some time. Foamy blood was found in all his major vessels. His heart had a foramen ovale large enough to pass a finger through.

Obesity

In the U.S., 24 percent of men and 27 percent of women weigh at least 20 percent more than standard height-weight recommendations. Obesity generally implies poor physical fitness and physical performance. Increased body mass takes more physical effort to move, both on land and in water. Mortality from accidents and injuries is significantly higher among obese persons.

An obese diver is often hampered by poorly fitting dive gear. Already overloaded by his bulk, reduced physical fitness, and smaller respiratory capacity, he needs to carry more weight to manage his buoyancy, further reducing his mobility in the water. No wonder obesity figured significantly in at least half a dozen deaths.

An obese 39-year-old woman was diving in a quarry with companions. On her second dive, her buddy indicated he had to ascend, but she was not at the surface when he arrived. After a brief delay, the companion found her at 132 feet with her regulator out of her mouth, her weight belt still on, but missing a fin, apparently unable to reach the surface. She was DOA at the local hospital.

It always seems foolish when a diver runs out of air; what is more puzzling is finding a diver dead with air left in his tank.

A woman and her buddy were 20 minutes into a dive, 17 feet deep in open ocean 300 yards offshore. They surfaced, and the woman indicated that she was not feeling well. She and her buddy began swimming toward shore. She became fatigued, dropped her weight belt, and said she could not make it to shore. She was assisted to nearby rocks but stopped breathing. Death was probably caused by drowning or embolism, possibly from fatigue and acidosis brought on by an acute asthma attack. Her morbid obesity complicated her efforts at self-rescue.

A 51-year-old obese man was cleaning the bottom of his boat, which was anchored in an inlet with a strong current. He had emptied one tank and was using a second. As he changed position on the boat, he was swept away by the current and drowned.

Insufficient Air

A 41-year-old man and his buddy were making a night dive in a freshwater lake on a designated dive trail. He became separated from his buddy and never reappeared. His body was found the following day with a 35-pound weight belt and an empty air cylinder.

A 37-year-old man was diving with a buddy in poor visibility at 60 feet. Ten minutes after beginning the dive, he indicated that his air was low. They started to ascend, but became separated. At the surface, his buddy could not see him. He was found on the bottom 20 minutes later with his buoyancy compensator deflated, his regulator out of his mouth, and 170 psi in his tank.

An experienced diver, diving without a buddy at a new wreck site in a strong current at 98 feet, became low on air. Another diver tried to help him, but he apparently panicked and lost consciousness due to hypoxia. The rescuer was unable to get the victim out of the wreck and was forced to surface when he began to run out of air.

A 30-year-old experienced diver making an open-ocean dive was found on the bottom with his regulator out of his mouth. Although he had not indicated any difficulty to companions, he had less than 100 psi left in his tank.

It always seems foolish when a diver runs out of air; what is more puzzling is finding a diver dead with air left in his tank. This may be due in part to the fact that the deeper one dives, the less effective a regulator may be in pulling air from a tank. Some regulators don't work as well as others under extreme conditions. While a good regulator will still work with 100 psi left at 130 feet, some regulators can't deliver from the same tank at 100 feet. Furthermore, the harder a diver breathes, the more work the regulator has to do. So a diver at 100 feet with 150 psi,

struggling like crazy to pull air from his tank, may not get any.

Bad Judgment

A 47-year-old man was diving at 224 feet when his buddy saw him vomiting and coughing up blood with the regulator out of his mouth. Unable to assist, the buddy surfaced to get help. The victim had filled his own tanks; the gas composition was not known, but a tank of 100 percent oxygen he carried for decompression was found later to have only 600 psi in it. His buddy thinks he accidentally switched to the pure oxygen regulator at depth and experienced a seizure.

Foolishness

Two divers were trying to set "personal best" depth records. The victim was last seen at 400 feet. His companion survived by inflating his BC just as he lost consciousness.

Ben Davison

Chamber of Horrors

Divers check in, but they can't check out

"We demanded to be released, and he [the chamber operator] just laughed and told us we would be released when he was done. When we insisted on being released, he began to yell at us, saying that we would use the oxygen masks or else. . . . He placed us in the hyperbaric chamber under false pretenses and then kept us there against our will. Was he experimenting with us? . . . My wife sincerely believed he was trying to kill us. The entire event became terrifying."

On November 21, 1994, Indiana divers Jack and Sally Kramer were enjoying a dive at Belize's Blue Hole. As Jack explained it, "After the first dive my wife became nauseous. However, during the surface interval she began to feel better and decided to do the second dive. That dive went well, but on the way back to Ambergris Caye she again felt sick and began vomiting. I took her back to our room and put her to bed, but the vomiting continued. Finally we became concerned and I sought medical help.

"We were referred to Dr. Otto Rodriguez. Dr. Rodriguez checked my wife over and started an IV to offset dehydration caused by the vomiting. Sally was still vomiting, so Dr. Rodriguez gave her a shot, which I later learned was a sedative. After about an hour, Dr. Rodriguez told us he suspected that Sally might have decompression sickness and that she should take a short half-hour chamber treatment. He told me that I should join her in the chamber to keep her company and a half-hour treatment would not hurt me.

"Sally did not want me in the chamber with her, but Dr. Rodriguez was adamant, so I joined her. Sally was very tense about this. After the half-hour was up, I asked that we be released, and he told us we would be in for four or five hours. We demanded to be released, and he laughed and told us we would be released when he was done. My wife sincerely believed he was trying to kill us.

"When he let us out, we went back to our room and packed and came home. My wife had 98 dives up to that point and now she refuses to dive again and even the thought of an island visit is terrifying to her."

Mr. Kramer wrote to the Belize Tourist Board and contacted DAN about their experiences. The Belize Ministry of Tourism met with Dr. Otto Rodriguez, then issued a report of their findings. Their conclusion was this:

"After reading the report by Mr. Kramer and comparing it with our findings, it is quite possible that Mr. Kramer and his wife could have over-reacted to the situation, particularly since it was noticed that there needs to be some improvement in terms of

Chamber of Delights

A new hyperbaric chamber has opened in Marathon, Florida. Unlike the claustrophobic quarters of most of the one-person chambers, which sometimes don't even allow for arm movement, this one has a bathroom, a television, a stereo, and reading material. Twenty-five feet long and six feet in diameter, it is said to accommodate a dozen adults comfortably, or two dozen in an emergency. However, at a cost of $500,000, I don't think the new units will be popping up at many dive locations.