

# AQUANEWS

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## Barracuda Attacks

Why divers can't take them for granted

Barracuda attacks on humans, including completely unprovoked ones, are more common than recognized. I learned that after an unprovoked barracuda attack amputated my left little finger and the side of my hand in Cozumel in 2004.

I was on a dive boat with my 13-year-old daughter, Marina, and we jumped into the water to snorkel and see the reef. We soon saw a large barracuda, 5-6 feet long, lying on the bottom. We stayed above it for 10 minutes, watching it. It never moved, but was certainly aware of us. After a while we headed on to see more of the reef.

My daughter had drifted about five feet away, and I started to swim toward her. At that point there was a stunning blow to my hand, but I never saw what hit me. I lifted my hand from the water and blood was pouring from it. My daughter said the barracuda had attacked. We began yelling, but the boat was a quarter of a mile away. Everybody was having lunch, and it took a long time before they noticed. I never saw my finger again, and imagine the barracuda ate it or spat it out when it turned out not to be fishy enough.

Marina said that the barracuda charged me with its mouth open and that we both disappeared in a cloud of bubbles. She saw the barracuda charge me two more times in rapid succession, but I am certain that it only bit me once. Barracudas often have a stereotypical triple strike behavior. People seeing barracudas attack fish often see the barracuda first bite right through the middle of large fish, then lunge twice more to go

bble down the head and tail. So perhaps the three strikes Marina saw were pure instinct.

### The Aftermath

It was only when I was on the boat that I realized that my little finger and the side of my hand were completely gone, and the bone stuck out of raw flesh. It barely hurt, perhaps because barracuda teeth are so sharp that they deliver clean cuts. The crew bandaged my hand. The dive boat, having a full load of paying customers for the next dive, arranged for me to be taken to shore by a small boat, then my daughter and I had to hitchhike to town. The dive shop gave me the directions to the DAN Center in Cozumel. In the emergency room they injected me with a local anesthetic, pulled off the bandage, cleaned the wound and sterilized it with hydrogen peroxide. I spent that night in the hospital on intravenous antibiotics, and by dawn the next morning DAN had sent a special plane with trained staff to evacuate me (and my daughter) to Miami for surgery. My little finger was gone and I had come within about a millimeter of losing the next finger as well, but the bite had just missed the tendon so I was able to move all remaining fingers as normally as possible.

Cuts from the outer teeth (barracudas have a couple rows of teeth) ran the length of that finger; had it gotten me an inch or so further over I would have lost all my fingers. The nerve to that finger had been severed, so I had lost all feeling in that finger, but it gradually recovered as the nerves regrew. I now I have a patch of brown skin with hair on my palm, and my thigh skin is on my

*(Continued on page 2)*

## AQUANEWS

THE OFFICIAL PUBLICATION  
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forearm, so I'm built upside down! But I have full use of the hand, and most people don't even notice that I'm digitally impaired.

The barracuda that attacked me was well known to local divers, as it had frequented the same reefs for years menacing divers. One friend, a Cozumel dive operator, told me that he was diving with a customer and the same barracuda twice swam at her (she was lying still on the bottom composing macro shots) and butted her full force with his head, but luckily with his mouth closed, so he caused a bruise, not a cut.

I later learned that the local divers actually blamed Marine Park officials for my attack. It is against Mexican law to feed any animals in the marine parks. However, dive operators told me Marine Park management would take important visitors out in boats and throw meat to the same barracuda that attacked me, in order to impress their guests. This barracuda had been habituated to food handouts from the very people supposed to prevent that from happening. But the operators all said that if they were asked they would be forced to lie, because if they told the truth they would lose their licenses to operate.

### Discussion

Every shark attack makes headline news around the world, but no barracuda attack ever does, largely because they are widely claimed never to happen. Mine did not even make the local newspapers in Cozumel.

I have swum with barracudas all my life (I've dived with tanks for 54 years). I have never been afraid of them, and until my own attack I had adamantly maintained that there were no known unprovoked barracuda attacks. I've also known that there could be no protection against them if they chose to attack you. When they go after a fish there are just a flash and a whirring noise because they move so fast you can't actually see the attack, just the remnants of the fish head and tail floating afterwards and a barracuda gulping the center part down. What I always found amazing is that one could be swimming along on one side of me, then there would be a sudden flash, the barracuda would instantly vanish, and suddenly it was swimming on my other side. I respected them and never tried to menace or provoke them.

After my attack I received close to a hundred personal descriptions of unprovoked attacks and near attacks by barracudas. These do not include attacks on spearfishermen, who are hundreds of times more likely to be attacked by barracudas (or sharks) going after their catch . . . or people who spear barracudas and miss them or make a glancing blow, and it turns on them. One spearfisherman I know in Port Antonio, Jamaica, was bitten three times by barracudas in separate incidents, but he was holding a dying fish every time.

Rockland Aquanauts Organization Inc.

Mission Statement:

**To provide, promote, and advance environmental protection, care, and voluntary clean-up of waterways by any and all lawful means; to promote the importance and care in every manner possible by environmental awareness and otherwise; to purchase, print, publish, and circulate literature to promote the importance and care of the waterways and the work of the Corporation. To perform all acts the Corporation may deem appropriate or advisable in such operation; to establish, provide, and voluntary clean-up waterways, to encourage, support and subsidize the cleaning and protection from pollution.**

I have had many descriptions sent to me of people who were bitten around glittery necklaces, bracelets, finger rings, and mask reflections, or of barracudas that charged these objects and suddenly stopped just short of biting, sometimes only an inch away. However, I wore no jewelry except my watch, which was entirely black, with the scratched glass face pointing upward. I know two people, one a hotel employee in the Maldives, and the other a submarine engineer at the Woods Hole Oceanographic Institution, who jumped in the water and were immediately bitten by barracudas. Perhaps it was the splash and light reflecting off the bubbles. The engineer jumped straight back into the boat with a tiny foot long barracuda hanging from his butt, and still has the hole to prove it, but is reluctant to show it! Clearly, attacks are far more frequent than realized.

See our presentation at the 2005 Association of Marine Laboratories of the Caribbean Conference in Curacao: [http://globalcoral.org/BARRACUDA ATTACK.pdf](http://globalcoral.org/BARRACUDA_ATTACK.pdf)

There is no doubt that diver's behavior can provoke attacks. An old friend from Jamaica, Phillip Motta, was once wiggling his fingers with his palm facing forward, and a barracuda got very excited and prepared to charge him until he realized it and stopped. Paul Herring was night diving in the Bay Islands of Honduras when a large barracuda seemed fascinated by the divemaster's light shining on it, and started getting agitated, so the dive master switched it off. Immediately the barracuda attacked Paul's mask face. It was unable to bite through the glass of the mask, but it knocked him unconscious and severed arteries in his nose and forehead. Though saved by his buddies, his face was pushed in by the impact and he needed many operations to recover.

The most horrifying barracuda attack story I've heard was told to me by a divemaster at the College of the Virgin Islands Marine Laboratory. During a DAN course on decompression chambers, the lecturers said there was not a single known case of an unprovoked barracuda attack, but a physician taking the course disagreed. He described an incident in which two divers who dived at the same location every week, would feed a large friendly barracuda that frequented the site. One day the barracuda was waiting for his handout, but they had brought no food. The first diver held his empty palms in front of him to indicate, "sorry big boy, no food for you today." The barracuda bit both off both his hands. The second diver hugged his hands under his armpits to protect himself, and the barracuda bit and savaged both of his forearms so that they "looked like meat that had been through a grinder." The doctor who told this story to the class ended by saying that "I was the physician who had treated them both."

### Conclusions

What is the lesson from all of this? Don de Sylva's advice 40 years ago, not to swim in murky water under poor light conditions and not to splash around while wearing flashy jewelry, seems the best we can do. A diver should not automatically assume that barracudas never attack without provocation, and treat them with respect. What makes an attack so unpredictable is the randomness of these incidents. People swim with barracudas all the time and are not attacked. I am the only person known to have been attacked in Cozumel, even though the waters are full of people splashing away at all hours, with shiny jewelry on their fingers, necks, wrists, toes, ankles, navels, and other body parts, and have never been attacked, while I, with none of those attractions, was.....

So, it's anyone's guess. Stay aware.



Barracuda c. Chris McLaughlin Shutterpoint

## The Risks of Oxygen at Increased Depth

What you better know if you're diving with Nitrox

Having been engaged in a discussion with a number of readers on Undercurrent's bulletin board, I've become aware of many misconceptions about the real risks related to central nervous system (CNS) oxygen toxicity and the rather benign effects of longer-term "low dose" exposure. Because so many divers use Nitrox these days and therefore are exposed to higher oxygen partial pressures than they would be with regular compressed air, it's important they understand the basic elements of oxygen physiology. There are real risks if limits are not observed, but they are relatively small and difficult to attain within normal diving ranges and practice. More often than not, unwarranted panic over slightly exceeding a depth can lead to excessive ascent rates, buddy abandonment, or other bad behavior when little risk will actually manifest. It's a confusing subject and bears some more in-depth discussion.

As divers, we must be concerned primarily with the effects of elevated partial pressures of oxygen that occur as we descend. It's the partial pressure of oxygen (PO<sub>2</sub>) that is most critical, not the percentage of oxygen in a mix.

*There are many misconceptions about the real risks related to central nervous system oxygen toxicity, and the effects of longerterm "low dose" exposure.*

### Dalton's Law of Partial Pressures

The total pressure exerted by a gas mixture is equal to the sum of the partial pressures of the components of the mixture (oxygen and nitrogen in the case of air or Nitrox), i.e.,  $P = P_1 + P_2 + P_3$  ("P" stands for each individual gas in the total mix), etc. Put simply, as your depth increases, there is a corresponding increase in the partial pressure of oxygen. At the surface we are naturally adapted to PO<sub>2</sub> at .21 atmospheres absolute (ATA).

For air, the PO<sub>2</sub> at a 66-foot depth in the ocean is expressed as .63 ATA of O<sub>2</sub>. This is derived from multiplying .21 (the percentage of O<sub>2</sub> in air) by the pressure in ATAs:  $.21 \times 3 = .63$  ATAs of O<sub>2</sub>. Though the percentage of O<sub>2</sub> in the air we breathe will remain constant, the PO<sub>2</sub> will increase with depth. Therefore, when breathing compressed air at 66 feet, we are breathing in three times as much oxygen as we did on the surface.

### The Hazard

The CNS is primarily affected in the acute phase, meaning a relatively but high PO<sub>2</sub> exposure. Predictable results will follow if oxygen limits are exceeded. You can use the acronym VENTID to help remember the CNS O<sub>2</sub> toxicity symptoms

- \* Vision: any disturbance including "tunnel vision," etc.
- \* Ears: any changes in normal hearing function
- \* Nausea: severity may vary and be intermittent
- \* Twitching: classically manifest in facial muscles
- \* Irritability: personality shifts, anxiety, confusion, etc.
- \* Dizziness: vertigo, disorientation

Even a cursory examination of these effects should illustrate the seriousness of a CNS O<sub>2</sub> hit in deep water. Onset and severity of symptoms do not follow any particular pattern, and may vary daily in an individual diver. There may be no warning from less serious symptoms before a full convulsion is precipitated.

Oxygen convulsions, per se, are not inherently harmful but imagine the implications for an untended diver, or even one with a buddy nearby. Management of a patent airway and subsequent rescue in such an extreme situation is nearly impossible, and the diver will almost certainly drown.

### Managing Oxygen Exposure

Back in 1971, when I worked on Navy diving projects, the PO<sub>2</sub> limit was commonly accepted to be 2.0 ATA. Over the years, this was backed off to nearly universal recommendation now of 1.6 ATA, which is the equivalent of 132 feet of depth if you are using Nitrox-32. Yes, you have probably read conservative recommendations to keep your PO<sub>2</sub> under 1.4, or even 1.3, but there have been no incidents of oxygen toxicity at 1.6 as long as the time limits are properly observed. The DAN Nitrox Workshop held in November 2000 (I was on the faculty along with other industry experts) universally concluded that a PO<sub>2</sub> of 1.6 was an appropriate operational limit for sport divers, thus ending an ongoing controversy.

However, understand that the partial pressure of oxygen only makes up part of the equation for oxygen "dose." The other variable is time, usually expressed in minutes at a particular PO<sub>2</sub>. NOAA has published a table (above) that allows quick reference for divers to plan exposures.

While the potential hazard of CNS oxygen toxicity cannot be underestimated, the good news is that the risk to sport divers is almost nonexistent if the NOAA limits are observed since there has never been a sport diving oxygen incident within the NOAA limits.

NOAA PO <sub>2</sub> and Exposure Time Limits for Working Divers: Normal Exposure Limits				
Oxygen Partial Pressure (PO <sub>2</sub> ) in ATA	1.6	1.5	1.4	1.3
Maximum Duration for Single Exposure in Minutes	45	120	150	180
Maximum Total Duration, 24-Hour Day, in Minutes	150	180	180	210

The “oxygen dose” is sometimes referred to as the “oxygen clock,” which implies the time limits with the PO<sub>2</sub>. Your Nitrox dive computer stores this information in its memory (along with changeable PO<sub>2</sub> settings), and will calculate your exposure. This is usually expressed as a percentage of the maximum dose rather than in a minute “count down” like remaining bottom time. If your diving practice is to avoid decompression, you will never approach the CNS dose limits because your no-deco time limit will always occur first. Because most divers tend to dive in multi-level profiles and don’t spend the entire dive at the maximum PO<sub>2</sub>, the actual “oxygen clock” rarely will even reach 20 percent of the dose limit. Note that there is no more danger with a 50-percent exposure to oxygen at 1.6 than there is with a 50-percent exposure at 1.4 or 1.3. It’s the total dose, not the PO<sub>2</sub>, that determines your risk factor. It’s this distinction that seems to lead to a lot of the confusion and rather absurd suggestions for increased conservatism.

### Other Considerations

Susceptibility to oxygen toxicity is increased by other factors. These include elevated carbon dioxide levels caused by hard working conditions or prolonged swimming efforts. Sport divers typically do not approach the exertion levels of actual working divers for which the NOAA/Navy limits were defined.

In fact, most divers swim lazily around the reef or wall, stopping to take photos or simply take in the sights. The most active part of the dive usually occurs at the beginning or end, where some higher swimming exertion happens descending against current, traveling to the starting point, or swimming back to the boat or shore. And this is typically in shallower depths where the PO<sub>2</sub> is so low as to be inconsequential. Divers, as a population, really don’t work very hard. A lot of overly shrill cautions about reducing PO<sub>2</sub>s came from those who had an incomplete understanding of how divers actually dive and what the Navy and NOAA limits were designed for in their original applications.

PO<sub>2</sub>s will obviously need to be lowered if your dive plan will exceed 45 minutes at 1.6 ATA. But for you folks on single-cylinder, open circuit scuba, whether breathing air or Nitrox, it is virtually impossible to reach the “dose” time limits.

### Breathe Easy

Oxygen has certain well-defined risk windows. But the hazards are easily avoidable by ensuring that your dive profiles observe the NOAA limits. Set your PO<sub>2</sub> at 1.6; watch your computer display your “dose” accumulation, and do not exceed the maximum depth limit for your Nitrox mix. The depth limit for a 1.6 PO<sub>2</sub> exposure on 32-percent Nitrox is 132 feet. If you go deeper, you will not spontaneously combust or go into seizures. But your time limit at increased depths will reduce. As a general rule, I do suggest observing the 1.6 level for PO<sub>2</sub>, but don’t panic if you briefly go deeper. Your computer will account for it. And most importantly: breathe in, breathe out, repeat as necessary.

You may also have heard divers refer to tracking their OTUs (oxygen tolerance unit). This refers to another form of oxygen toxicity that occurs on very long exposures at relatively low PO<sub>2</sub>s. This is primarily a consideration for saturation divers or dealing with patients in recompression chambers. It is impossible for open circuit divers to attain sufficient OTU dose to serve any practical discussion. If you observe CNS limits, OTUs take care of themselves.

You don’t have to take a day off from diving midweek to allow for “oxygen out-gassing,” as one reader was told. As Tony Soprano might say, “Fuggitabout it.”

*Bret Gilliam is a 40-year veteran of the professional diving industry. He founded Technical Diving International (TDI) and crafted the standards and procedures for training nitrox divers for that agency. He is extensively published on the subjects of nitrox, mixed gas, rebreathers, technical diving, oxygen physiology, and emergency treatment for divers in recompression chambers and in remote areas where evacuation is not an option. He is credential as a Recompression Chamber Supervisor and Diver Medical Technician.*

## Captain Morgan's Pirate Ship Found

The cargo has yet to be opened, but funder Captain Morgan USA hopes it's rum.

Content provided by [FoxNews.com](http://FoxNews.com)

The lost wreckage of a ship belonging to 17th century pirate Captain Henry Morgan has been discovered in Panama, said a team of U.S. archaeologists -- and the maker of Captain Morgan rum.

Near the Lajas Reef, where Morgan lost five ships in 1671 including his flagship "Satisfaction," the team uncovered a portion of the starboard side of a wooden ship's hull and a series of unopened cargo boxes and chests encrusted in coral.

The cargo has yet to be opened, but Captain Morgan USA -- which sells the spiced rum named for the eponymous pirate -- is clearly hoping there's liquor in there.

"There's definitely an irony in the situation," Fritz Hanselmann an archaeologist with the River Systems Institute and the Center for Archaeological Studies at Texas State University and head of the dive team told KVUE Austin. The Captain Morgan rum group stepped in on the quest for Captain Morgan after team -- which found a collection of iron cannons nearby -- ran out of funds before they could narrow down the quest.

The new funding allowed the team to do a magnetometer survey, which looks for metal by finding any deviation in the earth's magnetic field.

"When the opportunity arose for us to help make this discovery mission possible, it was a natural fit for us to get involved. The artifacts uncovered during this mission will help bring Henry Morgan and his adventures to life in a way never thought possible," said Tom Herbst, brand director of Captain Morgan USA, in a statement.

In the 17th century, Captain Henry Morgan sailed as a privateer on behalf of England, defending the Crown's interests and pioneering expeditions to the New World. In 1671, in an effort to capture Panama City and loosen the stronghold of Spain in the Caribbean, Morgan set out to take the Castillo de San Lorenzo, a Spanish fort on the cliff overlooking the entrance to the Chagres River, the only water passageway between the Caribbean and the capital city.

Although his men ultimately prevailed, Morgan lost five ships to the rough seas and shallow reef surrounding the fort.

The underwater research team included archaeologists and divers from Texas State University, volunteers from the National Park Service's Submerged Resources Center and NOAA/UNC-Wilmington's Aquarius Reef Base. And pirate booty or no, they said the story of Captain Henry Morgan was the real treasure.

"To us, the ship is the treasure -- the story is the treasure," Hanselman told MSNBC's Alan Boyle. "And you don't have a much better story than Captain Henry Morgan's sack of Panama City and the loss of his five ships."

Artifacts excavated by the dive team in 2010, including the six cannons, as well as any future relics will remain the property of the Panamanian government and will be preserved and displayed by the Patronato Panama



**ANNUAL MEMBERSHIP FEES**

Rockland Aquanauts Organization  
2011 Dues

I guess it is that time of the year again, Membership Dues are due.  
Last year all our members received much more than they gave out to the Organization.  
As usual you will be receiving a tax donation for the first \$25.00. Don't forget we  
have all the BBQ lunch's after every Lake Dive.

So please send in your \$42 dues to;

Rockland Aquanauts Organization  
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**July-August 2011**

Barracuda Attacks, The Risks of Oxygen, Captain Morgan's Ship Found , '11 Dues Due

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**\*\*Next Hessian Lake Dive\*\***  
**Sunday August 21st 9am Sharp**  
**Meet at the Administration Building**

**We are currently looking for a place to have our 2011  
Annual Dinner...**

**Any suggestions?**



Just search "Rockland Aquanauts" and join our group today!

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