

# Currents



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## Vigilance: noun vig·i·lance \ˈvi-jə-lən(t)s\

### **Definition:** the action or state of keeping careful watch for possible danger or difficulties

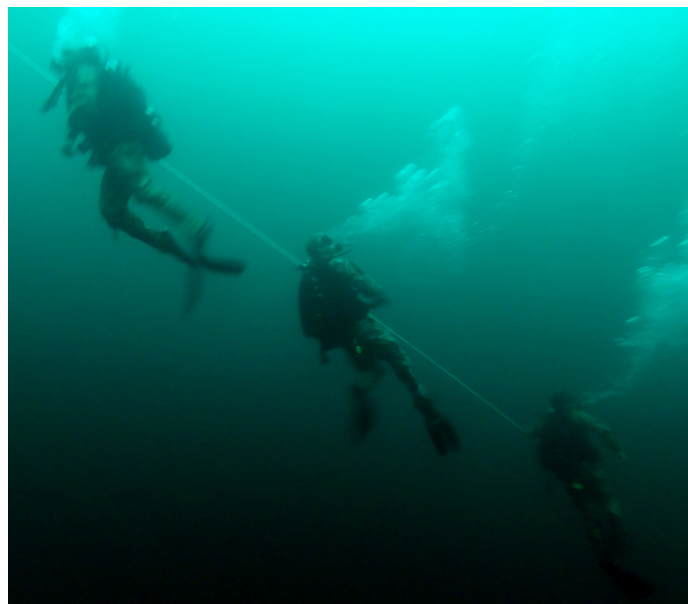
As human beings there are things we can control and there are things we cannot control. We can control our attitudes, we can plan our meals, and we can choose to participate in an exercise program. We cannot control mother nature, we cannot control the actions of others, and we cannot turn back time. As scuba professionals we do all we can to see to the comprehensive training and skill proficiency of our students, so divers are able to enjoy exploring our spectacular underwater world while taking all possible precautions, unfortunately problems occasionally arise.

*'Is there anyone so wise as to learn by the experience of others?' — French Philosopher, Voltaire.*

In recent US national news, several tragic stories have been shared that remind us of the need to always be alert if not vigilant in regards to awareness of our surroundings, maintaining accurate records, keeping to standards and making better judgement calls. The first tragic story retells the loss of life and health of two scouts after a lightning strike at a campout. While we may not be scouts at a camp out, we can take the opportunity to learn and recognize that we may need to refresh our precautions and procedures for when we are out with student divers and the weather turns sour. The second story relates a series of events resulting in the death of a scuba diver in training. While this tragedy did occur with another agency, there are some valuable lessons all can learn with the hopes of preventing any other like tragedy.

As we learn and grow from lessons gleaned from the experience of others, we are better equipped with knowledge to make wise decisions and take prompt action when necessary. We are better prepared to recognize possible dangers or difficulties as we are vigilant in keeping a careful watch. As educators we should also be learners. Learning and having new experiences is part of the reason we explore so many diverse and beautiful places around the world. ❖

*Right: Alabama National Guard divers performing a controlled ascent during a training exercise. [https://commons.wikimedia.org/wiki/File:Alabama\\_National\\_Guard\\_controlled\\_ascent\\_\(17310136912\).jpg](https://commons.wikimedia.org/wiki/File:Alabama_National_Guard_controlled_ascent_(17310136912).jpg)*



# SCUBA NEWS

## DRAM Student Manual - New Edition

A new 2016 edition of the Diver rescue and Accident Management (DRAM) student manual is now available. The price is \$25 per manual. Materials can be purchased from our offices. ❖

## Air and Nitrox Dive Tables - New Size

We have changed the medium the dive tables are printed on — from vinyl to a water-resistant, tear-proof polyester paper. The content of the tables

and the tables themselves have no changes. We listened to suggestions and made the tables a little bigger, easier to read, and cleaner — now sized to 8.5" x 11". These are the only tables available at this time. ❖

**AIR DIVING TABLES**

**Table A**  
TOTAL BOTTOM TIME (TBT) IN MINUTES

**Table B**  
SURFACE INTERVAL TIME (SIT) IN HOURS AND MINUTES

**Table C**  
RESIDUAL NITROGEN TIME (RNT) IN MINUTES

SEI & PDIC INTERNATIONAL ACCEPTS NO RESPONSIBILITY FOR ACCIDENTS ARISING FROM THE USE OF THESE TABLES



## NATIONAL DAYS

### August - September Events

- August 4 National Coast Guard Day
- August 7 Lighthouse Day
- August 19 Photography Day
- August 30 International Whale Shark Day
- September 4 National Wildlife Day
- September 17 Coastal Cleanup Day 2016  
<http://www.oceanconservancy.org>
- September 18 Water Monitoring Day
- September 21 International Day of Peace

## Coming in November

# EXPAND YOUR WORLD



**DEMA SHOW 2016**

Las Vegas Convention Center

Las Vegas, Nevada

NOVEMBER 16-19

SEI & PDIC booth #7035



<http://www.demashow.com/dema2016/public/enter.aspx>



# NATIONAL WILDLIFE DAY



**D**id you know: Sea Lions and Seals are both classified as Pinnipeds but have significant differences:

## Sea Lions

- Small flaps for outer ears
- Noisy and bark loudly
- 'Walk' on land by rotating hind flippers forward and underneath their bodies and using elongated fore flippers
- Congregate in groups called herds or rafts with populations of 1500 or more
- Spend more time on land enjoying laying in the noonday sun

## Seals

- 'Earless' or 'true' seals lack external ears instead have tiny holes on the sides of the head



*Top: Common Harbor Seal, by Andreas Trepte - Own work, CC BY-SA 2.5, <https://commons.wikimedia.org/w/index.php?curid=21012232>*

*Above Right: Steller sea lions haul out on a rock off the coast of Raspberry Island (Alaska). [https://commons.wikimedia.org/wiki/File:Alaska\\_2007\\_056.jpg#/media/File:Alaska\\_2007\\_056.jpg](https://commons.wikimedia.org/wiki/File:Alaska_2007_056.jpg#/media/File:Alaska_2007_056.jpg)*

- Quieter and softly grunt
- Belly crawlers on land but with small flippers are more aquadynamic and fast in the water
- Less social, spend more time in the water living relatively solitary lives
- Come ashore together only once a year to meet and mate ❖

<http://oceanservice.noaa.gov/facts/seal-sealion.html>



## Coastal Cleanup Day & Oceana: *Protecting the World's Oceans*

Oceana was established in 2001 after a commissioned study discovered that less than 0.5% of all resources spent by environmental non-profits in the U.S. went to ocean advocacy.

**Oceana's vision:** to make our oceans as rich, healthy, and abundant as they once were

Overfishing, pollution, destructive and wasteful fishing practices all threaten ocean ecosystems, damage natural habitats and harm both marine wildlife and

human health. As Oceana along with many other impactful organizations work towards bettering and healing our oceans we as divers will be enjoying the benefits of seeing our reefs teeming with fish, corals flourishing, clean waterscapes and marine life populations rebounding. What a beautiful site!

Whatever agency you choose to support, please be involved in Coastal Cleanup Day 2016. ❖

<http://oceana.org/>

<http://www.oceanconservancy.org/our-work/international-coastal-cleanup/sign-up-to-clean-up.html>



# Know the Risk

**R**ecently in the news, the Boy Scouts of America are being sued for the wrongful death/injuries of two boys who were struck by lightning in 2011 while participating in a scout camp in an area where there had been a lot of thunderstorm activity and where they would potentially be exposed to lightning.

One young man died and the other survived with ongoing long-term injuries. The claim is that the leaders who were with the scouts were not adequately trained to recognize and respond to hazardous weather conditions. This initiated a conversation as to what is the current advice to the scuba industry for lightning safety.

There are surprisingly very few authoritative industry sources on lightning and scuba diving and appropriate safety recommendations. Scuba Instructors should take into consideration weather conditions when planning open water training and dives. Anything that could pose a threat or risk of injury or death should be addressed. Avoid diving during a storm is best, even waiting until 30 minutes after the storm has ended before returning to the water. Being aware of current and coming weather conditions for the location and time of the dive is a must and could be discussed as part of the dive briefing.

Each dive experience is different with each posing various conditions to consider:

- what is the nearest form of shelter (a vehicle, nearby building)?
- how far away is shelter (did you hike a mile to get to the spring or is there shelter near the water)?

- is there a long walk loaded with gear across a sandy beach (making a diver the tallest thing around) or through a canopy of trees (providing some protection)?
- if on a boat – does it have tall masts/antenna? Does it have a cabin? Remember when on or in water, any boat or person often becomes the highest object making them more susceptible to lightning strikes.

Recommendations from Divers Alert Network's:

*"avoid diving or being in the water during a storm. It's hard not to be the tallest object around if you're on the water, and current can travel significant distances over water's surface. Some might think it is a good idea to stay underwater as lightning does not tend to penetrate very deeply into the water column, but this is not practical in most situations. Gas supply, no-decompression limits, body temperature and stamina are all more important considerations. If you surface from a dive in a storm, it might be reasonable to consider continuing to dive at 20 to 30 feet, especially if you surfaced far from the boat or shore and have reason to believe the storm will be short-lived or is quickly losing intensity. However, this approach should be considered only if all safe diving guidelines can be followed; getting out of the water quickly generally is a better option."*

(Alert Diver *Lightning* by Brian Harper, Summer 2011)

<http://www.alertdiver.com/Lightning>

The National Weather Service and the National Oceanic and Atmospheric Administration have also posted recommendations when lightning is likely. ❖

*Background Photo: By Mircea Madau - Edited version of Image:Lightning over Oradea Romania 2.jpg, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=5322846> [https://en.wikipedia.org/wiki/Lightning#/media/File:Lightning\\_over\\_Oradea\\_Romania\\_3.jpg](https://en.wikipedia.org/wiki/Lightning#/media/File:Lightning_over_Oradea_Romania_3.jpg)*





# Lightning Safety Outdoors

*Guidelines according to the US National Weather Service and the National Oceanic and Atmospheric Administration (NOAA):*

## **When a Safe Building or Vehicle is Nearby**

There is little you can do to substantially reduce your risk if you are outside in a thunderstorm. The only completely safe action is to get inside a safe building or vehicle.

## **When a Safe Location is not Nearby**

If you absolutely cannot get to safety, you can slightly lessen the threat of being struck with the following tips. But don't kid yourself—you are NOT safe outside. Know the weather patterns of the area you plan to visit. Listen to the weather forecast for the outdoor area you plan to visit. The forecast may be very different from the one near your home. If there is a high chance of thunderstorms, stay inside.

- Avoid open fields, the top of a hill or a ridge top.
- Stay away from tall, isolated trees or other tall objects. If you are in a forest, stay near a lower stand of trees.
- If you are in a group, spread out to avoid the current traveling between group members.
- If you are camping in an open area, set up camp in a valley, ravine or other low area. Remember, a tent offers NO protection from lightning.
- Stay away from water, wet items, such as ropes, and metal objects, such as fences and poles. Water and metal do not attract lightning but they are excellent conductors of electricity. The current from a lightning flash will easily travel for long distances.

## **On the Water**

The vast majority of lightning injuries and deaths on boats occur on small boats with NO cabin. It is crucial to listen to weather information when you are boating. If thunderstorms are forecast, do not go out. If you are out and cannot get back to land and safety, drop anchor and get as low as possible. Large boats with cabins, especially those with lightning protection systems properly installed, or metal marine vessels are relatively safe. Remember to stay inside the cabin and away from any metal surfaces. Stay off the radio unless it is an emergency!

## **Scuba Divers**

If the boat you are in does not have a cabin you can get into during lightning activity, then you are safer diving deep into the water for the duration of the storm or as long as possible. ❖

For more information visit <http://www.lightningsafety.noaa.gov/outdoors.shtml>

*Above photo: By Bidgee - Own work, CC BY 3.0, <https://commons.wikimedia.org/w/index.php?curid=3799380>*



# Who Is at Fault?

## *A Training Death During an Entry Level Scuba Diving Course*

By Kenneth Tuttle Wilhelm,  
SEI & PDIC Course Director, Malaysia

**W**e all know that scuba diving as an activity has inherent risk, and that the training we provide is designed to mitigate those risks. We also know that most diving accidents and injuries are due to human error. Occasionally, diving injuries occur due to preexisting health problems.

Just as we, as professional educators, must adhere to training standards, in the confined and open water, it is incumbent upon us to show the same diligence of care when out of the water. Following is a true life event, that ended in death. A death that could have been prevented at various stages throughout.

A news article was filed on June 23, 2016. It discusses a law suit that a woman has initiated in response to her husband's death during a scuba training dive. The link to the original article is found at the end of this article.

Following is a synopsis of the events, with some follow up commentary:

1. The dive student, and his family, knew that he had preexisting medical conditions that required a medical physician's clearance



Above: <https://commons.wikimedia.org/wiki/File:Inhaler.jpg#/media/File:Inhaler.jpg>





to dive. Those health conditions were: High Blood Pressure and active Asthma.

2. The dive centre knew that the dive student had these medical conditions, based on the student's responses on the medical questionnaire. As a result, they required the student to go and obtain medical clearance before participating in the dive class.
3. Apparently, the doctor did not review the guidelines for a diver's physical examination. As most of us know, the RSTC Medical is a multi-page document.
4. Even though the dive student was presenting medical symptoms at the time of the visit to the doctor, the doctor still signed off on the following statement:  
*'I find no medical conditions that I consider incompatible with diving.'*
5. On Day 1 of diving, the dive student completed two dives with no apparent difficulty.
6. On Day 2, the dive student suffered an asthma attack on the second dive.
7. On Day 2, a different instructor, with the same dive centre, observed the dive student using an asthma inhaler.
8. Not completing the second dive on Day 2, meant that the student would need at least another dive to complete the certification, as prior to the asthma attack the diver had only completed three open water dives on scuba.
9. On Day 3, during the training dive, the student indicated 'out of air', and the student

along with the instructor commenced an emergency ascent.

10. According to the news article, the emergency ascent went awry and was not completed successfully. The Instructor needed to swim back down to bring the dive student to the surface.
11. The dive student upon being brought to the surface, was barely responsive and could not be revived by the medics who arrived in response to the emergency.
12. The autopsy revealed:  
*'A forensic pathologist said cause of death was cardiac dysrhythmia associated with scuba diving and an enlarged heart with chronic asthma being a contributing factor.'*

So it was concluded that the dive student's death was a combination of the scuba diving activity and his preexisting medical conditions.

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What are the most important and salient points about this tragedy?

1. The wife and the dive student were aware of several medical conditions (conditions that are considered relative risks to scuba diving requiring formal medical evaluation). And yet, they decided to continue with the programme.
2. The doctor for some reason did not review the guidelines for the physical examination of a diver who had specific medical conditions. And additionally, the doctor prescribed medication (asthma inhaler) for the dive student's condition.



3. The dive centre (and presumably the dive instructor) knew of the pre-existing medical conditions.
  4. The dive instructor observed the student suffer an asthma attack on the second day of diving, during the third open water dive.
  5. Another Instructor from the same dive centre observed the student using an asthma inhaler.
- 

In retrospect, what questions should we ask, that as dive students, divers, and professionals, that will help us learn from this death?

1. Why would the wife and dive student have continued to pursue scuba diving, when the medical statement indicates that conditions such as asthma and high blood pressure are medical conditions that could affect a diver's safety while diving?
  2. Why did the doctor not review the "Guidelines for Recreational Scuba Diver's Physical Examination?" Is it possible that the doctor was not provided with the complete medical statement and guidelines?
  3. Why did the instructor who observed the asthma attack during the second dive on Day 2, still continue with another dive the next day?
  4. Was there communication between instructors and the dive centre in reference to observing the dive student use the inhaler on Day 2?
- 

There were multiple points where this tragedy could have been avoided. The way to avoid it, would have been to not participate in scuba diving. Either the wife, the student, or the instructor had opportunities to 'just say no'.

Divers, divers' families, and potential dive students need to understand that Scuba Diving is putting an air breathing individual into an environment that is not only unforgiving of mistakes, it also puts stresses on the body that are not normal. And these stresses lead to decreased safety, in particular when there are underlying, preexisting medical conditions.

For Instructors and Dive Centres, the aforementioned comments about stresses should always be first in mind when dealing with dive students, and already certified divers. Safety first and always, that's why we have training standards. But even before standards, what's the PRUDENT thing to do?

As a final thought, the "Medical Statement and Guidelines for Recreational Diver's Physical Examination", states:

*'A large proportion of scuba diving deaths in North America are due to coronary artery disease. Before being approved to scuba dive, individuals older than 40 years are recommended to undergo risk assessment for coronary artery disease. Formal exercise testing may be needed to assess the risk.'*

Instructors and Dive Centres need to be proactive in screening-out potential students and current students who have acknowledged or observed medical conditions.

This student could very well have been counseled at the beginning that his medical conditions presented very serious risks when participating in scuba. And after the asthma attack, the instructor and dive centre should have considered discontinuing the training for this student. At the very least, to give the student time to be reevaluated by a doctor. ❖

The following is the web link to the original news story:

<http://www.statesmanjournal.com/story/news/2016/06/23/stayton-woman-les-wrongful-death-suit/86148286/>



# Maintaining Proper Equipment Standards for a Safe and Healthy Dive

*By Jupesi "José" González, SEI Assistant Instructor & EMT-B*

**M**aintaining proper equipment standards is very important in order to ensure a healthy safe diving experience. Diving accidents occur not only as a result of diver inexperience, but because of improper/unsafe equipment usage.

Other times divers fall ill due to their own equipment malfunction. Sometimes it is easier as instructors to have everything set up for our students, but we need to remember the importance of not just teaching new divers what each piece of gear is called and why we use it, but to take the time to teach about how gear works and how to clean, store and maintain gear. Once certified, it is ultimately the diver's responsibility to make sure personal scuba diving equipment is in full working order and they should be guided as to how to recognize potential problems with both their own personal and rental gear.

Some scuba diving equipment can be easily maintained by the diver him/herself at home such as the mask, snorkel, fins, and dive suit. By cleaning and storing these items properly, the diver can prevent malfunctions during a dive such as leaks, broken straps, salt erosion, moldy tasty/smelly gear and ripped or leaking suits. As scuba leadership we have the opportunity to build a rapport with divers while students, so when they have questions about their gear, they know the person in which to turn for assistance. Not only does this aid them, but in doing so, divers may become interested in additional training and courses.

If a diver chooses to invest in a personal buoyancy control device (BC), a regulator or a tank, they should strongly be encouraged to take the Equipment Service course. I recently took the course and learned that there are many components to the regulator. If the regulator is not properly inspected for issues, or regularly cleaned and repaired when needed, it can have serious consequences resulting in a regulator malfunction and breathing problems at depth. All it takes is one little piece, such as an o-ring, to burst within the regulator to malfunction and you can end up having a diving emergency. Also when out on a dive location, knowing how to perform simple repairs can save a dive experience.

Whether a diver owns his/her personal set of gear or rents, they need to be encouraged to develop a relationship with a reputable dive store as some maintenance requires more professional assistance. Gear should be inspected regularly with the frequency increasing with usage. On a BC, issues with the inflator/deflator valves can result in buoyancy problems while tanks need annual visual inspections and five-year Hydro testing. If the air from a tank tastes or smells questionable it is possible the air was contaminated by the compressor fumes or other source and a dive should be aborted.

By teaching student divers what to look for when using scuba gear, potential hazards can be identified and rectified prior to any injury. Promoting dive gear maintenance sets the stage for a fun, successful and healthy dive experience. ❖





# The Era of Dive Instruction with Safety First – Has Gone!

*By Spencer Slate, SEI Instructor Trainer  
with Haley Wisely, SEI Instructor*

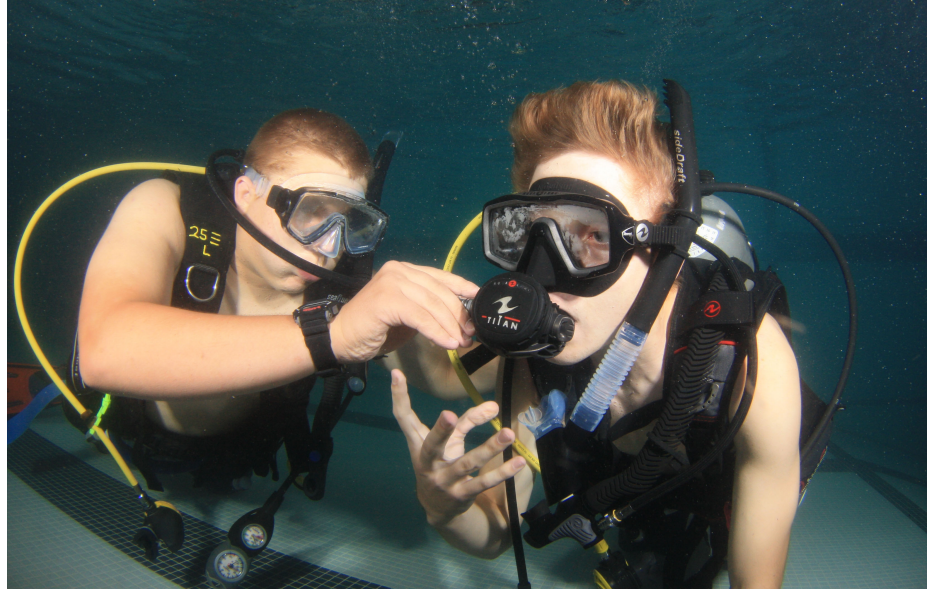
**A**fter running dive boats for 40 years and being a diver for 53, the era of being trained to handle any malfunction, accident, or situation in the water, is over. As an industry, we simply have given in to the 'do it fast and quick' method of instruction.

We, from the beginning of the dive instruction age and those who work in the dive boat/diving end of this industry cannot fathom why this happened. Over time on my dive boats I witness mistakes and errors, some that have resulted in a dead or injured diver. I also serve when asked as an expert witness in the dive accident/boat accident field. The cases of dead and injured divers and the causes are unbelievable. It defies common sense, reasoning, and logic that some major training agencies have decided to 'shorten' dive courses to the point they are daily putting divers' lives in danger.

There once was a time when, to become a dive instructor, you actually had to know how to safely be a strong swimmer and prove it with a timed swim before even being considered for instructor training. Skills like ditch and don, blackout mask swims, breathing on malfunctioning dive gear underwater and how to figure it out while underwater, mask removal (not flood) and replacement, scuba swim without mask, and manual buddy breathing (which for decades was the only way to breathe with a buddy and save his life) – skills we never thought of as useless in training as we knew all those issues happen in the real world and we were simply preparing for it. It helps to know every issue that can occur and teach our students skills to respond appropriately to these things. Those that obtain our training succeed and go on to be great divers.

Things I witness every day on my boat – divers who cannot change an o-ring; divers with no spare mask/fin straps or o-rings; and divers that cannot manually inflate their BC's if there is a leaky o-ring on the inflator hose. We see divers watching the diver next to them so they will know how to hook up their gear, they have no clue! Can you believe that? One diver I observed simply would not dive without her auto-inflator which was leaking. She had no idea how to manually inflate the BC and when shown, was scared to death because she would have to take her regulator out of her mouth to inflate the BC, unbelievable! Many times, over and over, a diver swims frantically to the boat with a flooded mask, not even knowing how to clear it or scared to even pull their mask off to clean it, never having been taught to swim without a mask in an emergency. I cannot tell you how many

Student divers practicing buddy breathing technique during pool training. The donor should be in control of the second stage at all times.



times my mask has been knocked off or flooded and it should be a nothing skill to replace the mask on your face and clear it.

I was just recently involved as an expert witness in a tragic double death of two divers on someone's private boat. The first diver whose gear did have an octopus, ran out of air, but his buddy only had a single second stage and tried to help by giving him air. The first diver panicked and he held a "death grip" on her regulator. Since the first diver had never been taught how to manually buddy breathe in her basic Open Water course from the major training agency, she simply handed him her regulator without holding on to the hose to get it back. The photos of the bodies on the bottom clearly showed the man on the bottom with a death grip on her hose, holding her down by her second stage. Otherwise, she would have been free to ascend... so sad and it never should have happened. We require all dive regulators to have an octopus regulator on them now in this day and era, but it never fails, someone on their private boat will not have one and having never been trained in manual buddy breathing is a fatality waiting to happen.

Instructors can be just as poor divers as Open Water divers. Just because a diver possesses an Instructor card or professional rank, does not make them a good diver. Verifying their skills and competency in the water is the way to be sure. I have jumped into the water and grabbed a new Instructor performing out of air ascent training by turning off the students air in 30 feet of water and sending them to the surface alone. He stayed at the bottom and did not follow them up to make sure they exhaled. The worst part was the Instructor had no idea why I was furious with him! This is what a dive operator puts up with on a daily basis unless the instructor has been taught from the "old school", meaning safety first, nothing left out.

Simple instructions on the dangerous maladies of diving physics which can occur are left out of some training agencies Open Water courses. I believe the reason they do this is they feel it could scare the student and they may drop the class resulting in loss of revenue. I have never had a student drop out of my class because of my physics lecture. They loved the information and totally understood the effects of pressure. I was at our pool and had a lady come up to me and asked me if I taught swimming and I said of course we do. She then told me she and her husband were already certified divers but she could not swim. I taught her how to swim and she and her husband became great divers. If you are an instructor and have never 'failed' a student, you are doing something wrong. The student could do makeup work and learn better swimming and diving skills to come up to minimum standards. The end result is only their life!

It is simply the wrong direction some of our major agencies have been heading in for years and has directly caused fatalities and injuries, verified. When picking an agency and Instructor to complete dive training, divers should look for an Instructor with years of experience or one taught by someone who comes from the original scuba education model, YMCA, now SEI. Where safety is paramount no matter what else, do not leave out any skill and teach more. When you have firsthand experience having to do CPR on a diver lying on the beach or deck of your boat due to a mistake they made simply because they were not trained how to handle a simple error, will change your life instantly. Scuba diving is a serious hobby and needs to be treated as one. The extra time we take to show and teach the sport correctly, the better the outcome will be for us and future divers to come. ❖



# Buoyancy Control in Scuba Training, Done Right

*By Kenneth Tuttle Wilhelm, SEI & PDIC Course Director, Malaysia*

**H**ow are the Anti-lock Brake System (ABS) and the Buoyancy Compensator (BC) similar? They both are about enhancing safety. The ABS helps to prevent losing control of a car, when a driver must apply the brakes forcefully in slippery conditions. The BC provides positive buoyancy on the surface. And over time the BC has become a device used to establish neutral buoyancy while underwater as well.

Do either of these technological advances mean that drivers or divers should have less skill than before ABS and the BC were available? I would argue that the answer is no. Drivers and divers should continue to get the same skill training and development, no matter what safety equipment comes onto the market.

What I have noticed in scuba training over time, is that the BC has allowed instructors to train and certify students at a lower level of attained skills than was possible in the pre-BC days of scuba diving. This is particularly true among the resort and tourist market. Unfortunately, this means that the average diver today, has nowhere near the skill level of the diver trained before the mid-1980's. It's simply not educationally, pedagogically possible, to train a dive student in two or three days, to be equal of the divers of yesteryear.

The advent of the BC and the subsequent over-utilization of BC functions, has replaced the challenging and rigorous programmes that only a few agencies still

provide. In my observations, the BC has been the major contributor towards the decline of students' understanding of proper weighting and breath control.



Before the BC, diving looked like this: (see photo, left).

All we had was a harness, attached to the tank. All buoyancy (positive, neutral, negative) was controlled by the diver's practiced breath control, and having an amount of weight that could be accommodated within the diver's lung volume.

Let me say that again, in another way:

Buoyancy control was taught as a combination of breath control (control and use of lung volume), and carrying an amount of weight that was near-exact the amount needed to compensate for the diver's personal buoyancy, and that of the tank and other gear.

In the past year, I've been specifically working with experienced, novice, and

beginning students to establish a protocol for myself, that will help divers to develop a personal expertise with buoyancy control, that is similar to the divers of yesteryear.

How do I accomplish this with my students?

First I explain to the students, that the buoyancy we must account for, actually consists of three variables:

1. buoyancy of the diver's body (with only a swimsuit)
2. buoyancy of the tank at the end of the dive, a three-minute safety stop at 5 metres (15-20 feet), with 35 bar (500psi) remaining in the tank
3. buoyancy of whatever exposure protection that a diver needs in the local environment

We test each student's personal buoyancy in the shallow water by:

- A. Having the student exhale completely, and seeing if they sink to the bottom, or they float at or near the surface. If they are already negative, then we do not need to give them any weight for the buoyancy of their body. If they are positive, then we give them increasing amounts of weight, until the exact amount that will cause them to sink slowly to the bottom upon a complete exhalation.
- B. We look up the characteristics of the tanks we're using to find out the buoyancy of the tank when it's at 35 bar (500 psi). This amount of positive buoyancy must be compensated by adding that amount of weight to the scuba equipment setup (we put it on the weight belt).
- C. We test the buoyancy of the BC and the exposure suit. If using wetsuits, this is a rather straightforward process. Drysuits will take more in water experimentation. Again, the amount of weight needed to create



neutral buoyancy for the BC and exposure suit will be added to the weight belt.

At this point we'll have the student swimming on scuba in the shallows of the pool (1.4m-2m/5-7 feet) practicing to maintain their body in mid-water using breath control (lung volume). If the student is unable to stay off the bottom, then it might be good to consider giving that student a smaller tank.

For example, an AL80 (Aluminum scuba cylinder capable of holding 80 cubic feet/12 Litres of air), at 35 bar (500 psi), is positive by 2.34kg (5.15 lbs). This is the amount of weight a diver will need on the scuba setup, to compensate for the buoyancy at the safety stop.

Some smaller women or youth divers, may have difficulty finding neutral buoyancy with only lung volume when carrying a full tank, and the weight needed for the safety stop. In this case, we ensure that this diver will have the opportunity to dive with an AL63 (Aluminum scuba cylinder capable of holding 63 cubic feet/9 Litres of air). Without going into all the math, doing this will reduce the total weight that the diver is carrying by 2.5kg (5.5 lbs). This usually is enough of a change to accommodate divers with a smaller lung volume.

My preference is to get the student 'balanced' whereby they can control their neutral buoyancy in the shallow, with only lung volume. I want the student to be able to start developing this lung volume control in shallow water, before we introduce the use of the BC to aid in establishing neutral buoyancy in the shallow and deeper waters of the pool.

This is a brief explanation of what I do, taking into consideration an assortment of variables, considerations, and adjustments. I do welcome those who have questions, to open a conversation with me directly. Please note that I'm only fluent in English and Mandarin Chinese. ❖





# Treasure in Your Own Backyard...

By Carol Reed, SEI & PDIC Instructor Trainer

**Diver's Log, 06/05/16:** Sunday morning; Philips Outdoor Center, Indiana

I have always told my students, “every dive is a treasure hunt. You will never know what cool creatures you will see”. That was certainly true this morning, even before I got into the water.

I arrived at Philips Outdoor Center at 8:45 am. The morning was sunny, pleasantly warm, absolutely beautiful. We have some special fish in the quarry, thanks to some fishermen who have caught them in various places and released them in our quarry. First one I see as I look into the water at the entry point is the sucker fish. There is only one of these in the quarry, and I have seen it on the last three dives. It wanders all over. Next, I sat on the bench on the concrete platform to watch the bluegill nesting, and within a minute in swims one of the big flathead catfishes. He settles down on the shallow bottom right below me, rests for a bit, then moves again a little, but stays in the area. From the left I see something big approaching, and it is a big carp swimming lazily to the south. A big bullfrog on the north shore sings his deep bass-voiced song. This aquatic show all happened in the fifteen minutes I was waiting for my buddy, Scott Johnson to arrive.

Scott arrived. We got ready to dive, and made a dive plan. Do a wall dive by going to the north first, because at the present time there is a lot of silt layers on the north wall. My theory is the bluegill

Daddies are so busy making nests, it is creating some silting in the water, as I am only seeing this silt in shallow areas that are the right configuration for nesting. By the way, it is really cool when you see a male and female bluegill swimming side by side in the “spawning dance”. I have seen that twice in the last week.



*Above: Spawning by Tom Leaird.*

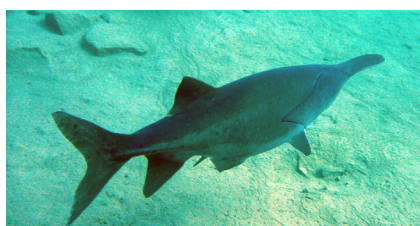
As we approached the back wall, the silt layers disappeared. I spot the Channel catfish up ahead, the one who spends the winter lying in a submerged tree. It is interesting



*Above: Channel catfish by Carol Reed.*



to watch the serpentine motion of its body as it swims. I am watching it for several seconds, and turn to my left to be sure Scott sees it. At that moment, not far from the wall, a paddlefish appears, then a second paddlefish! Both are swimming slowly to the north and slightly above us at 12 feet deep. The further one continues on, but the other paddlefish checks us out for at least a minute, slowly swimming small circles around us before finally heading out. Awesome!



Above four photos: Paddlefish by Tom Leaird.

We continue our journey around the wall to the south. Scott spies the Channel catfish again, swimming along the south wall. I am being followed by a friendly bluegill who has been with me since the beginning. I decide it is time to reward him with a lunch of a few zebra mussels.



Above: Zebra Mussels by Tom Leaird.

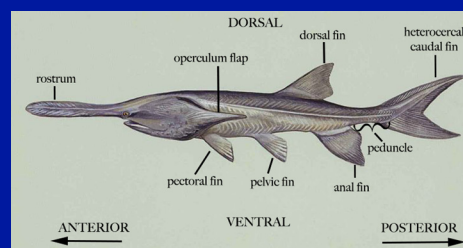
Almost made the full circumference of the quarry. Now we are in the shallows of the southwest corner. I always look under the really big rock that sits on the wooden deck, because often a flathead catfish is hiding there. Was he there today? Yes!

Before surfacing, I give my little bluegill buddy one more serving of mussels on the half shell, then say good-bye until next dive. This was truly a dive full of treasure. It is so nice to have this Underwater Backyard right here in Muncie. ❖

# American Paddlefish

(*Polyodon spathula*)

- is a species of basal ray-finned fish closely related to sturgeons
- has a skeleton that is almost



- entirely cartilaginous, a paddle-shaped rostrum (snout) that extends nearly one-third their body length, and a heterocercal tail or caudal fin, much like that of sharks
- are mainly a freshwater fish which can grow to over 8 ft (2.5 meters) and weigh as much as 70 lbs (32 kg)
- has a rostrum and cranium covered with tens of thousands of sensory receptors for locating swarms of zooplankton, their primary food source making them filter-feeders who will not take bait or lures
- begin spawning around age seven to ten years old. Females do not spawn every year, rather they spawn every second or third year producing anywhere from 70,000 to 300,000 eggs. Males spawn usually every year or every other year. American paddlefish are broadcast or mass spawners. Eggs are released into the water over bare rocks or gravel at the same time males release their sperm. Fertilization occurs externally. The eggs become sticky after they are released into the water and will attach to the bottom substrate. Incubation varies depending on water temperature, but in 60 °F (16 °C) water the eggs will hatch into larval fish in about seven days.
- are now being raised in Ukraine, Germany, Austria, the Czech Republic, the Plovdiv and Vidin regions in Bulgaria, Russia and former USSR countries, Cuba and China
- are harvested for their meat and roe (caviar)
- are classified as a vulnerable species in the US due to their declining populations caused by overharvesting spurred on by the rise in caviar demand and decrease in sturgeon stocks; sedimentation and river modifications preventing ideal spawning ground; and dams preventing the paddlefish from swimming upstream to former spawning grounds ❖

[https://en.wikipedia.org/wiki/American\\_paddlefish](https://en.wikipedia.org/wiki/American_paddlefish)

<http://www.umes.usgs.gov/aquatic/fish/paddlefish/faq.html>



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