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Canadian Institute of Underwriters
SCUBA: Diving Deeper

James Dixon

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AGENDA

- 1 Qualifications
- 2 Equipment
- 3 Enriched Air
- 4 SCUBA accidents and injuries
- 5 SCUBA mortality
- 6 SCUBA and comorbid conditions
- 7 Questions

Certification

North America



Europe

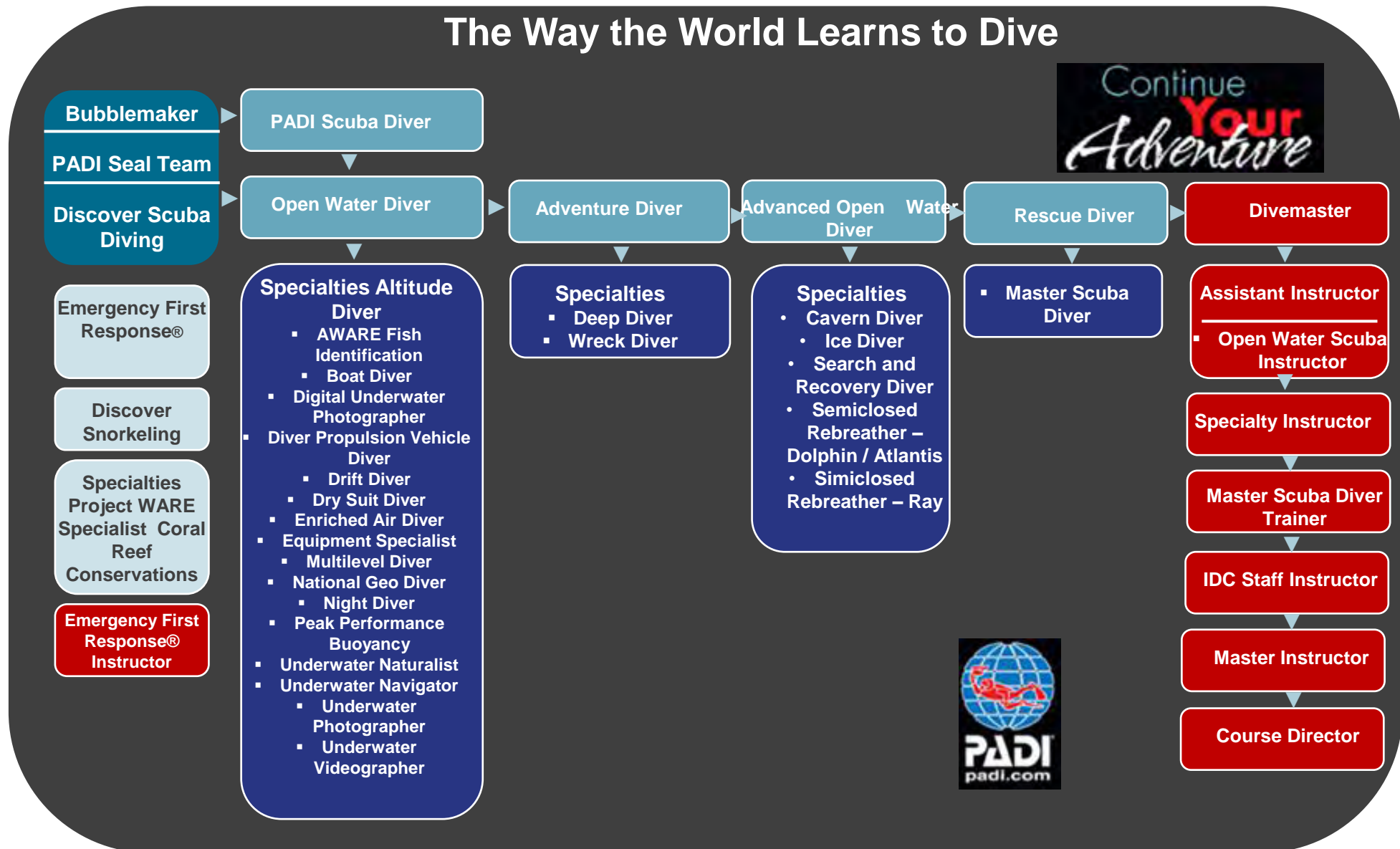
- BSAC- British Sub Aqua Club



- CMAS- Confédération Mondiale des Activités Subaquatiques/
The World Underwater Federation



...From Bubblemaker to Divemaster



Equipment



Enriched Air



Photo - <https://diverdans.com/shop/padi-enriched-air-nitrox/>

Nitrox (Enriched Air)

What is Nitrox

- An abbreviation of Nitrogen-Oxygen the primary content of the air we breathe every day

Benefits

1. As a time extender
2. To lessen the risk of developing DCS
3. Get back in the water quicker
4. Many divers claim to be less tired after dives on nitrox

Risks

1. Oxygen toxicity

DEPTH	AIR	NITROX	
FSW (FEET SEAWATER)	21% O ₂ (IN MINUTES)	32% O ₂ (IN MINUTES)	36% O ₂ (IN MINUTES)
60	60	100	100
70	50	60	60
80	40	50	60
90	30	40	50
100	25	30	40
110	20	25	30
120	15	25	*
130	10	20	*
* Exceeds maximum safe depth.			
NOTE: This chart is based on U.S. Navy air tables and NOAA nitrox tables. It is for comparison only and should not be used to plan or execute a dive.			

Photo - <https://www.SCUBAdiving.com/training/basic-skills/nitrox-myth>

Going Deeper

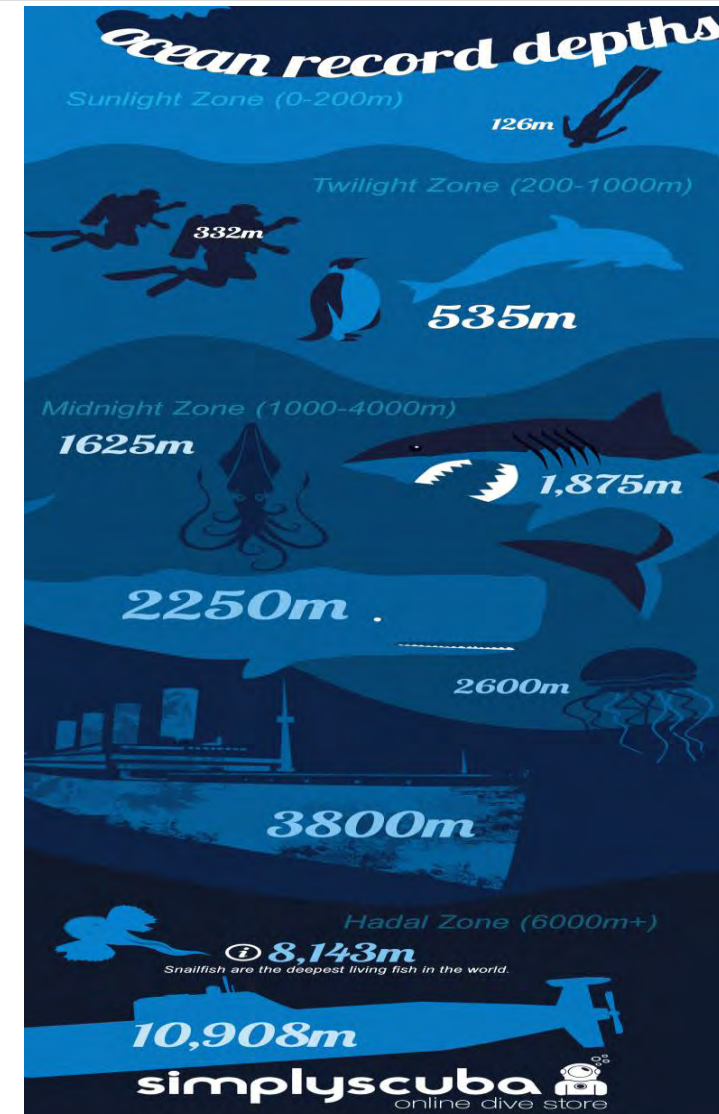
“From birth, man carries the weight of gravity on his shoulders. He is bolted to earth. But man has only to sink beneath the surface and he is free.” - Jacques Yves Cousteau

What is Heliox?

- Heliox is a mixture of helium and oxygen used for very deep diving, usually to greater than 200 feet

What is Trimix?

- Trimix is a mixture of oxygen, helium and nitrogen. Nitrogen, usually in a small percentage (e.g., 15%), is added back to heliox to create trimix
- Trimix is used for the deepest SCUBA dives, usually greater than 400 feet



SCUBA Accidents and Injuries



Nitrogen Narcosis

"I remember vividly the first time I was narced. The world was amazingly bright and warm. Every thought that passed through my mind was hilarious. I was convinced that this very moment was the best I'd ever had. Though some voice in the background was telling me, "Uh-oh, we could get in trouble here," I just didn't care. This was too much fun." – anonymous

- What is Nitrogen narcosis?
- What are the symptoms?
- How is it prevented?
- What is the treatment?



Photo - <https://kontikithailand.wordpress.com/tag/nitrogen-narcosis/>

Decompression Sickness

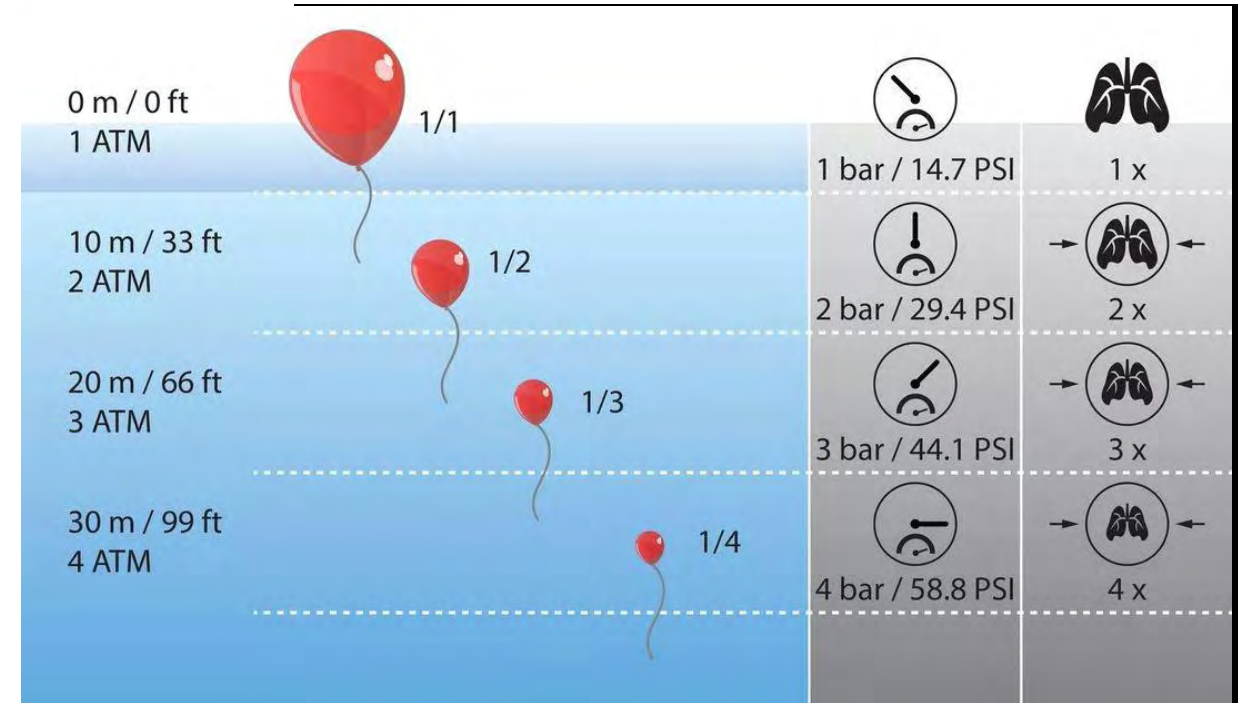
“SCUBA diving, from the beginning, had an air of dangerous allure. Every landlocked schoolboy knew of its intriguing hazards: the bends, which caused a diver's veins to fizz with carbonated blood until he died a ghastly, percolating death; and rapture of the deep, which took away his reason, filled his heart with false contentment, and drew him down into the ocean gloom.”

- What is Decompression Sickness?
- What are the symptoms?
- How is it prevented?
- What is the treatment?



Pulmonary Over-Inflation Syndrome (Pulmonary Barotrauma)

- What is Pulmonary Barotrauma?
- Why does it occur?
- What are the symptoms?
- How is it prevented?
- What is the treatment?



Diving Mortality



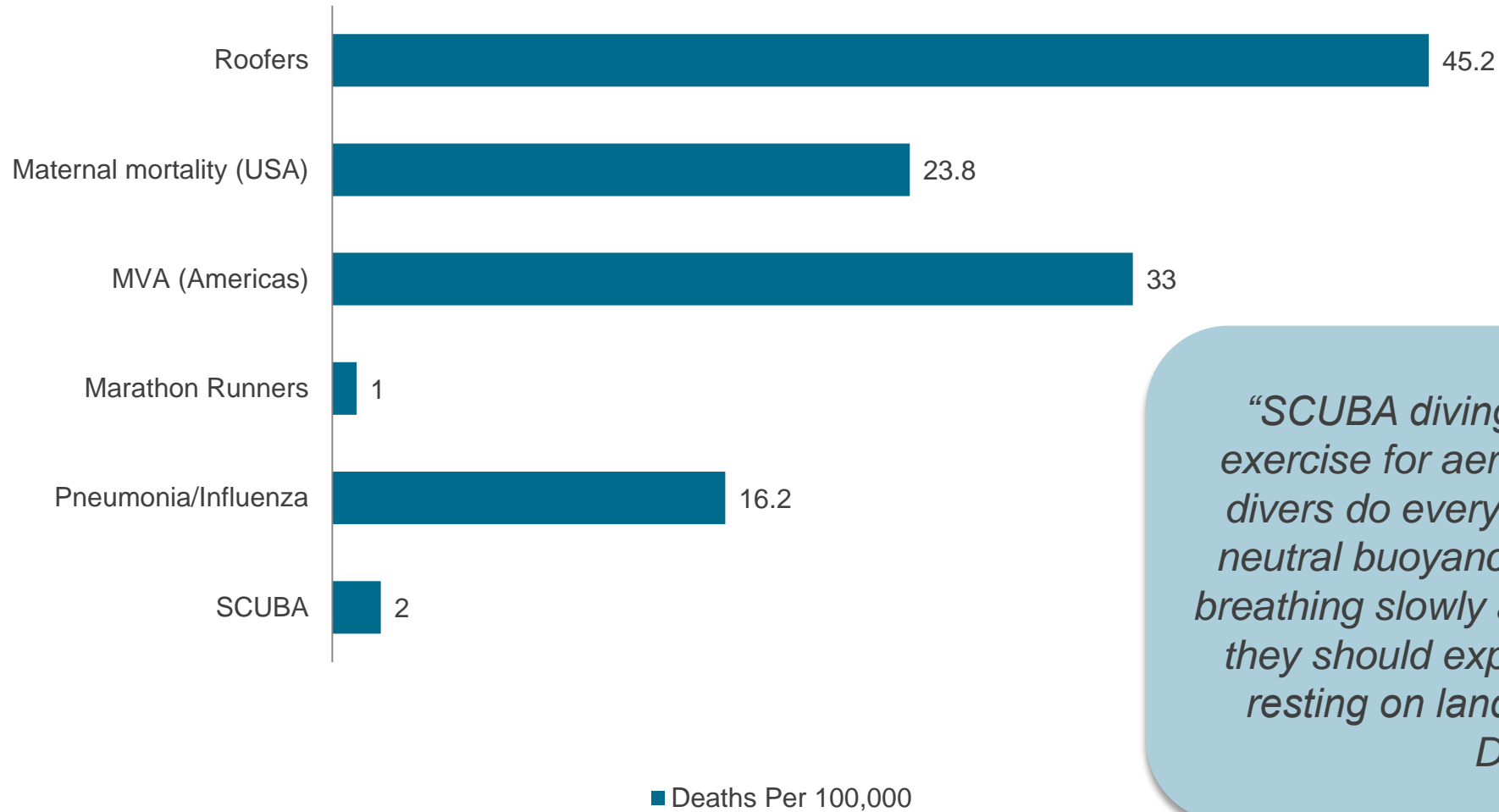
1) Photo - <https://www.pinterest.com/pin/769271180070076130/>

Diving Deaths “Remember when sex was safe and diving was dangerous?”

State/Province	Count	State/Province	Count
Florida	15	Arizona	1
California	8	Illinois	1
Hawaii	3	Missouri	1
Michigan	3	Nova Scotia	1
North Carolina	3	Oregon	1
Washington	3	Pennsylvania	1
Massachusetts	2	Quebec	1
Maine	2	South Carolina	1
New York	2	South Dakota	1
Ontario	2	Wisconsin	1
Alabama	1	TOTAL	54

1) DAN Annual Diving Report 2016 Edition: A report on 2014 data on diving fatalities, injuries, and incidents

How Does this Compare...



“SCUBA diving is not considered a good exercise for aerobic conditioning. If SCUBA divers do everything "right," by maintaining neutral buoyancy, drifting with currents, and breathing slowly and deeply while underwater, they should expend less energy than when resting on land.” - MICHAEL STRAUSS, Diving Science

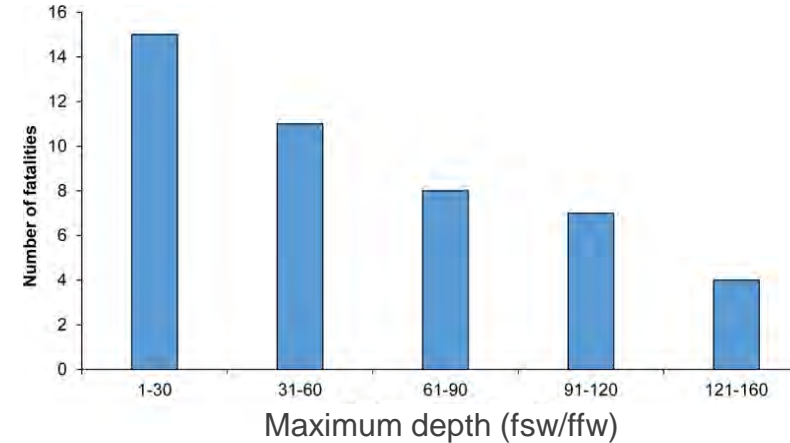
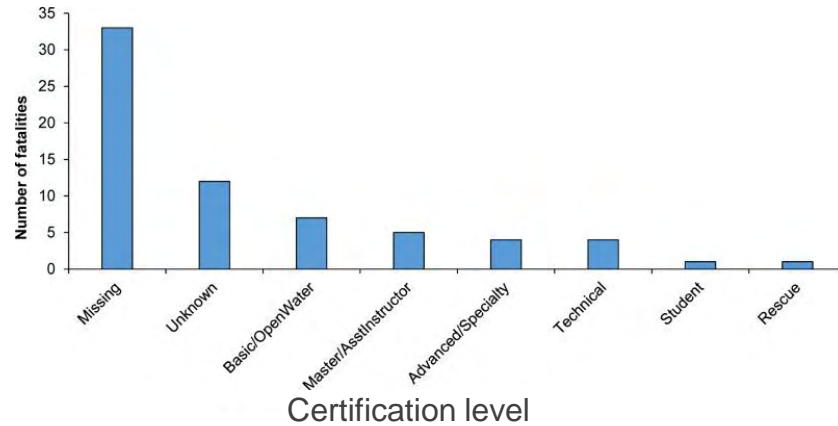
Causes of death

“SCUBA diving is very much a black and white world in terms of the laws and rules one must abide by. It comes down to clear-cut physics. If the laws are broken, severe penalties are exacted, including paralysis or even death.” - CARLOS EYLES, The Blue Edge

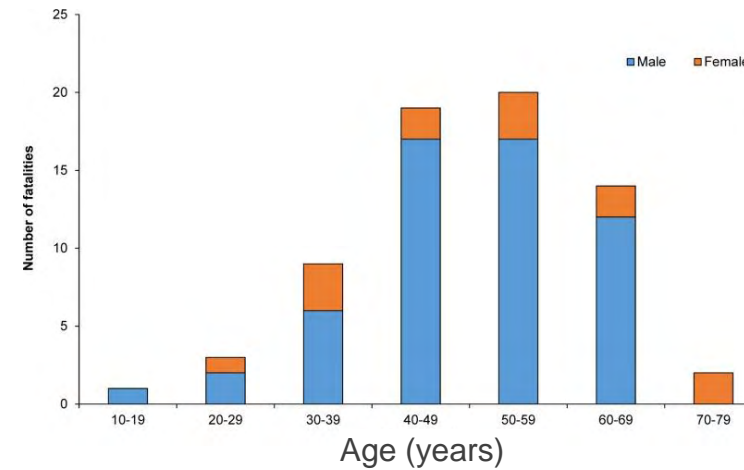
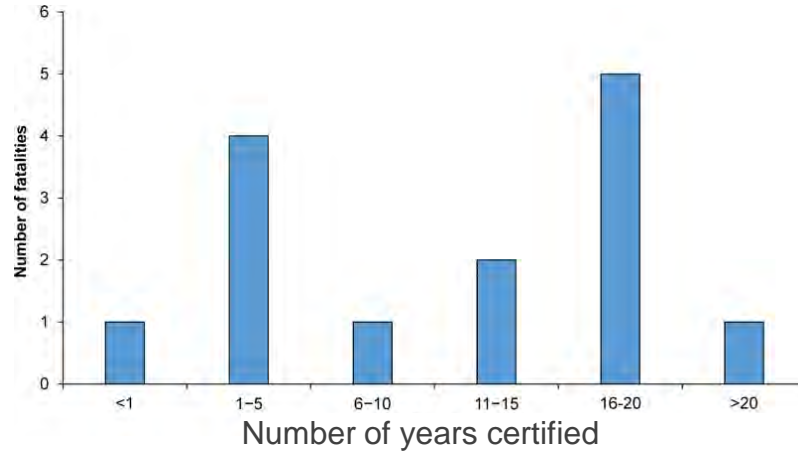
<u>Trigger</u>	<u>Total</u>	<u>Mechanism</u>	<u>Total</u>	<u>Cause of death</u>	<u>Total</u>
Alcohol intoxication	1	Cardiac event	5	Arterial Gas Embolism	2
Entanglement (line)	3	Hypertensive/Atherosclerosis cardiovascular disease	2	Anoxic brain injury	1
Entrapment in rocks	1	Insufficient breathing gas	5	Atherosclerotic cardiovascular disease	4
Equipment malfunction	2	Insufficient buoyancy	3	Cardiac event	7
Equipment misuse	1	Natural disease	4	Drowning	21
Low on / Out of air	6	Out of air	3	Hypertensive and atherosclerotic cardiovascular disease	2
Natural disease	12	Probable oxygen induced seizure	1	Hypertensive cardiovascular disease	1
New dry suit	1	Rapid ascent	2	IPE (Immersion pulmonary edema)	1
Panic	1	Struck head	1	Probable cardiac	2
Probable oxygen toxicity	1	Stroke	1	Probable drowning	3
Regulator free flow	1	Unknown	40	Unknown	24
Separated from the boat	1				
Surge	1				
Unknown	36				
Total	68	Total	68	Total	68

Certification and Safety

- As a diver's certification level increases there is a noticeable drop in the rate of fatalities – despite the presence of deeper more technical dives. Note: majority of deaths occur during shallow recreational dives.



- However, the number of years someone has been certified does not have the same protective effect.



Can I Dive with....? Medical Conditions of Concern in SCUBA

1) <http://www.diversalernetnetwork.org/medical/faq/>



Diagnosis: Asthma

Concerns

- A number of factors inherent to diving can trigger an attack
- Reduced lung capacity at depth

When should someone not dive

- Anyone with severe asthma — meaning they have daily, chronic symptoms — should not dive

When is it ok to dive

- If asthma is mild, intermittent and controllable
- The UHMS (Undersea and Hyperbaric Medical Society) workshop panel felt that the risk of diving is probably acceptable if, the diving candidate with some asthmatic 'history' demonstrates normal pulmonary function at rest (FVC, mid-expiratory flow, FEV1, FEF 25-75) and then again after strenuous exercise



Diagnosis: Diabetes

Risks

- Divers with diabetes are at risk of sudden loss of consciousness
- Individuals with diabetes, however well the diabetes is controlled, should not be deemed as fit to dive without restriction

Recommended guidelines (DAN)

- Age ≥ 18 years
- Delay diving after start/change in medication, with stability for at least 3 months with oral agents, and 1 year on insulin
- No episodes of hypoglycemia or hyperglycemia requiring intervention from a third party for at least one year
- HbA1c $\leq 9\%$ no more than one month prior to initial assessment and at each annual review

Limitations on scope of dive – dive should be planned to avoid:

- Depths >100 fsw (30 msw) or duration >60 minutes
- Compulsory decompression stops or overhead environments (e.g., cave, wreck penetration)



Diagnosis: Cardiovascular

ASD/VSD

- The diver with a known ASD or VSD should know of the potential increased risk of decompression illness and make an educated decision whether to continue diving

Vasovagal and Carotid Sinus Syncopes

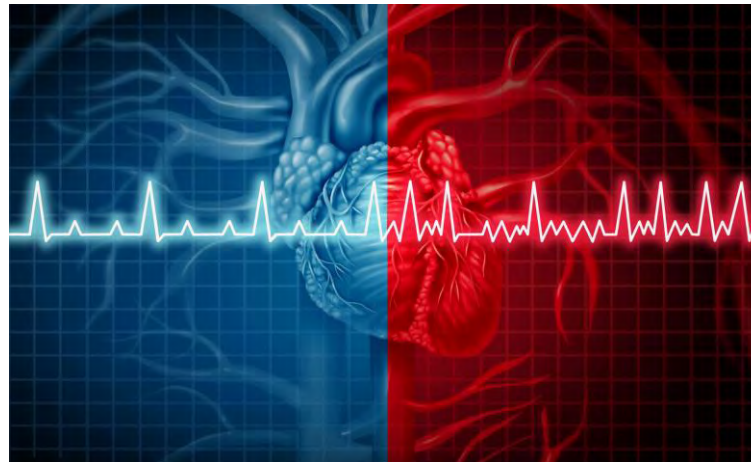
- Condition in which a person may suddenly and unpredictably lose consciousness should be considered disqualifying

Irregular Heartbeat (Dysrhythmias)

- Serious dysrhythmias, e.g., ventricular tachycardia & many types of atrial rhythm disturbances, are incompatible with diving

Myocardial Infarction

- Regardless of whether an individual has had a revascularization procedure (CABG or angioplasty) a recommended period of six to 12 months is recommended before resuming diving



Diagnosis: Neurological

CVA

- Vigorous exercise, lifting heavy weights and using the Valsalva method for ear-clearing when diving all increase arterial pressure in the head and may increase the likelihood of a recurrent hemorrhage
- A cerebral hemorrhage in a young person in whom the faulty artery has been repaired with little persisting damage may permit a return to diving, with small risk
- Fitness to dive will depend the extent of disability caused by the stroke (e.g., paralysis, vision loss)

Epilepsy

- Loss of consciousness or loss of awareness while underwater carries a high risk of drowning or embolism from an uncontrolled ascent
 - However - No evidence exists that diving with compressed air SCUBA to the accepted 130 fsw limit increases the risk of epileptic seizures



Changes in How We Underwrite SCUBA

Ratings

- Any dives that require mandatory decompression stops have inherently more risk - these will always require a rating
- Any type of dive where the surface is not immediately accessible in an emergency – ice diving, cave diving, wreck penetration will require a flat extra at a minimum.
- Dives over 120ft

Co-morbidities

- Most conditions do not specifically exclude someone from diving if the condition is well controlled
- In cases where there is poor control of diabetes, recent MI with any impact on fitness, or any condition that can lead to an unexpected loss of consciousness would exclude or decline

Credits

- Consider a lower rating (or credit) for healthy divers under age 40 with greater levels of experience/training
- No extra rating for the use of Nitrox

