

## Padding on Cold Water

By Glen Green, P.E., Chairman Safety Committee, United States Canoe Association; Navy Safety Engineer (1991-2006)

The importance of wearing a PFD when paddling on cold water is being brought to National attention by the United States Coast Guard Auxiliary which just issued a "News Release" on February 7, 2011 titled "Life Jackets Saves Lives in Cold Water Too".



<http://auxpa.org>

<http://tinyurl.com/48fg3bf>

This News Release states that "Swimming ability in warm water has little relationship to the ability to swim in cold water. Mario Vittone, a former Coast Guard rescue swimmer states 'It is impossible to die from hypothermia in cold water unless you are wearing an approved flotation device, because without flotation - you won't live long enough to become hypothermic, you will most assuredly drown'."



Photograph by: Cecilia A. Duer, National Water Safety Congress: "If you find yourself in cold water....It's a fight for your life!"

"When the temperature of water is below 50°F significant physiological responses occur, including the possibility of death, the causes of death may include cardiac arrest, deep body (core) cooling resulting in unconsciousness, and circulatory collapse, all of which could end in drowning. The effects of cold water immersion are predictable and well documented by what is known as the **1-10-1 Principle**:

**1 minute:** Upon immersion in cold water, the body reacts with an involuntary gasp, followed by hyperventilation of up to 10 times regular breathing (if head is underwater during that initial deep gasp, a person can inhale enough water to drown). Avoid panicking-- breathing will return to close to normal.

**10 minutes:** A person immersed in cold water will become incapacitated as limb muscles stop working and prevent swimming or self-rescue, so swimmer should attempt to rescue themselves, before incapacitation

becomes a factor. If this is not possible, try to get as much of the body out of the water as possible to delay the onset of hypothermia.

**1 hour:** After about 60 minutes (depending on the water temperature), the body continues to cool. The resulting hypothermia can create a range of symptoms from confusion to unconsciousness, eventually leading to death."

**Post Rescue Collapse** (Circum Rescue Collapse): A victim "gives up the fight". In Post Rescue Collapse, which occurs just before, during or after rescue (up to several hours after rescue), the victim has symptoms which can range anywhere from fainting to physical incapacitation to death. The production of adrenaline ceases once rescue appears eminent. The feeling of safety stops stress hormones from being produced. Keep the victim still until medical treatment arrives.

The dangers of hypothermia from capsizing in cold water have long been known by experienced paddlers and racers. What may not be known by many of us is the "gasp reflex" from cold shock. No matter how much skill and experience you have, or how fit you are, or how young you are, or if you can swim or not; if you suddenly flip into cold water you will involuntary gasp.

These physiological responses are described in a paper written by Dr. Chris Brooks, Survival Systems Ltd <http://tinyurl.com/4ec32e7>:

"Cold shock is caused by rapid skin cooling and can kill within three to five minutes after immersion. On initial immersion, you make a huge inspiratory gasp. Being immersed in near-freezing cold water is also extremely painful, and the sudden sensation of acute pain can accentuate the inspiratory gas. The gasp is followed by severe hyperventilation: a fourfold increase in your breathing rate. It is not uncommon for you to be panting at a breathing rate of up to 65 times a minute in this critical stage, so there is no chance to hold your breath. Indeed, in water below 60°F, your breath-holding ability is reduced by 25-50 percent. If the water is near freezing, even after the effects of cold shock have settled, you'll only be able to hold your breath for about 12-17 seconds."



Photograph by: Cecilia A. Duer from Cold Water Boot Camp USA

*“The rapid breathing rate on its own can cause muscle spasms of the limbs and chest. All of these breathing irregularities increase the risk of drowning if you dip underwater or have a wave splash over your face. It only takes an inhalation of about five ounces (150 ml) of water to cause drowning. Drowning is a combination of cardiac arrest and suffocation. Your heart stops beating within one to two minutes after you have inhaled a significant amount of either fresh- or seawater. Water in the lungs compromises your ability to exchange oxygen, and because respiratory movements may occur for up to five minutes when underwater, water can continue to be drawn into your lungs.”*



Photograph by: Cecilia A. Duer: “Incapacitation after a few minutes in cold water”

Some people who are submersed in cold water, instead of gasping, experience a laryngospasm, also known as “dry drowning” <http://tinyurl.com/4m2c7ub>. A laryngospasm can occur if the trachea below the vocal cords detects the entry of water, resulting in an uncontrolled / involuntary muscular contraction (spasm) of the laryngeal cords which causes a partial blocking of breathing in. This is not the same as having one's breath knocked out from force, or swallowing wrong and choking, nor is it related to the shock of falling into cold water and having it “take your breath away”.

Whether a person immersed in cold water gasps and inhales water, or experiences a laryngospasm; either outcome prevents effective breathing when the victim surfaces. Because of this it is important to try to keep your head out of the water if your boat tips over, or get your head above the water immediately before a gasp is uncontrollable. This is why wearing a PFD is critical, because if you do inhale some water the PFD will bring you to the surface and keep you on the surface as you are gasping or choking. Being an athlete in great shape has no impact on the body's response to cold water. Strong swimmers have died before swimming 100

yards in cold water. In water below 40°F, such victims have died before swimming 100 feet.

On March 6th, 1968 nine elite marines, water survival instructors, while paddling a war canoe across the Potomac River capsized in 36°F water wearing sweat suits, and while they had seat cushions, they had no life jackets. None of them survived the attempted 100 yard swim to shore <http://tinyurl.com/267ezx>

To see a video of a cold-water immersion event, please check out the DVD “Cold Water Boot Camp USA” and “Beyond Cold Water Boot Camp USA, Rescue, Recover, Re-Warm” at <http://www.watersafetycongress.org> and <http://www.coldwaterbootcampusa.org>.

If you want a good simulation, turn on the shower and let it run for a couple of minutes. Run only the cold water and not hot water. Let the cold water hit your back and the back of your neck and see how long it takes for you to have a spasm.

You may ask yourself, “Well, I have seen members of ‘Polar Bear Clubs’ in the Winter, when the water temperatures are approaching freezing, run down into the water and splash around for a short time without any life-threatening side-effects.” However, if you observe closely, those that actually dive into the water are gasping when they surface, and usually they are not in water over-their-heads so they are able to stand up to catch their breath; or if the water is over their heads, there are rescuers in very close proximity to help them if they get into trouble.



Photo from <http://antarcticswimclub.com>

With practice some people can learn to control the gasp reflex, and some even have the physiology to retain core body heat. *Lynne Cox* has swum one mile in 33°F water and five miles in 40°F water <http://tinyurl.com/nuxa>. There are some who have a unique physiology suited to adapting to the cold air and cold water, but these are rare individuals.

When paddling on cold water it is important to stay close to shore unless you can remount your boat immediately (surfski, outrigger canoe), have a bomb proof roll (kayak with a spray skirt), or are able to get on top of your capsized boat. Cold water robs the body's heat 25 times <http://tinyurl.com/67ub5qd> to 32 times <http://tinyurl.com/2ugsf9> faster than cold air.



[http://www.uscgboating.org/safety/life\\_jacket\\_wear\\_wearing\\_your\\_life\\_jacket.aspx](http://www.uscgboating.org/safety/life_jacket_wear_wearing_your_life_jacket.aspx)

*"Life jackets are the seatbelts of the water, always wear a life jacket."* {Cecilia Durer, Executive Director, National Water Safety Congress}. Consider a USCG approved inflatable PFD if you find that a standard PFD restricts your movements propelling your craft. Some of these PFDs automatically inflate from hydrostatic pressure of the water (for example: <http://tinyurl.com/4erkkqi>).

Layers of protective clothing (wool, polypropylene, CoolMax®, etc.), although keep you warm and help wick away sweat while you are training or racing, they are instantly converted to ice-cold dead weight when immersed in cold water. Such clothing is only useful when worn inside a waterproof shell (jacket, pants, drysuit) having neoprene or latex gaskets at the ankles and wrists. Dress for the water temperature, not the air temperature.

What is considered "cold water" by an organization is influenced by the probability of being immersed:

USA Swimming 77°F, USA Triathlon 75°F, National Water Safety Congress 70°F, American Canoe Association 70°F, United States Search and Rescue Task Force 70°F, United States Rowing Association 50°F, United States Coast Guard Auxiliary 50°F, American Whitewater 50°F.



Photograph by: Cecilia A. Duer: "Medical attention is needed if incapacitation occurs."

Many canoe and kayak racers say "It is wrong to impose safety mandates on individuals in a free society, like requiring paddlers to wear a life jacket." While it is true that we don't want regulations that do not contribute to the safety of "athletes in water sports", but do you want to take a stand and be "dead-right" on your freedom of not having to wear a PFD when paddling on cold water?

While skill and experience may significantly lessen the chance of capsizing in cold water, stuff happens even to the best of paddlers, maybe a missed stroke, maybe the hull of the boat slides up a submerged tree branch, or maybe a paddle strikes a rock while taking a stroke or leaning for a brace, leading to a flip. Don't let these upcoming warm spring days ahead lull you into complacency, the best chance for your survival is to wear a life jacket when paddling on cold water. ☺



Photograph: <http://www.smart-start-kayaking.com/Cold-Water-Paddling.html>

**Note:** The National Boating Safety Advisory Council is requesting publishers of all materials to use the term "life jackets" because it is felt that many individuals do not understand what a PFD is. [*The Boy Scouts of America is also making this change to their "Safety Afloat @" training.*] The Code of Federal Regulations (U.S. Coast Guard Regulations), however, still uses the term PFD (Personal Flotation Device).