



# Mad Ice Diver: Under Arctic Ice

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Most divers get their first taste of ice diving in some local lake. Unfortunately, after going through all the trouble of getting to the site, cutting through the ice, and donning the heavy gear, the majority of them are relatively unimpressed. After all, there isn't much to it; the only real differences between February and July at most lakes are the water temperature, the crystalline sheet overhead, and the thickness of the insulation.

Don't let those first few lake dives fool you, though - they aren't the finish line. Think of them instead as a primer for bigger, stranger, more frigid adventures. Huge stalactites hanging under ice pack a dozen feet thick; twisting caves in the bellies of towering icebergs; glacial pools like clear punchbowls. And don't forget the creatures that live in those icy Northern waters - sea anemones, whales, seals, even the carrion eating Greenland Shark, the fourth-largest shark in the world.

These environments are what you're training for when you dip into the icy water of Lake Nearby, and they present challenges far beyond anything you'll find there.

Unfortunately, there are some large hurdles to overcome if you're thinking about taking up ice diving. For one thing, suitable training locations are not always accessible; in the northern U.S. and southern Canada, ice may not freeze consistently thick enough, and warm spells might make the ice that does form unreliable. (Unpredictable ice can spell big trouble for the divers underneath it, which is why most beginners do their first ice dives in small lakes or quarries, where ice is thicker.) In addition, organizing an ice diver weekend requires logistical know-how and a large surface support crew. Most dive shops offer one or two weekends each winter because of the effort, expense, and equipment involved.

These two major problems have pushed ice diving into a narrow realm. Most divers see it as either a way of getting wet over the winter, or as some extreme pursuit best left to National Geographic (and DIVERS) personnel. Ice diving has never received the practical attention wreck and cave diving have; as a result, while both the latter have developed progressive levels of formalized instruction and passionate groups of dedicated divers, the former has remained relatively exotic.

Again, there are some sound reasons for this discrepancy - great ice diving destinations are typically far away and on the expensive side, for one thing. For another, ice diving requires certain surface equipment (e.g. melting gear) that regular diving does not. On the other hand, all technical diving worth its salt presents challenges to overcome; the things you see and learn underwater are the payoff, and the whole idea is to find dives that make the headaches worthwhile.

Thought the typical "southern" ice dive is reasonably limited, there are a ton of incredible environments in the Arctic and Antarctic regions. They present great opportunities to hone a brand-new set of underwater skills, things you won't get to use if you're in some quarry under a foot or two of freeze. These locations are well worth the time and investment, if only to show divers glossy underwater worlds few ever see up close.

Here are a few of the most common ice-diving techniques and environments, along with some things to look out for in each. Keep in mind that many of the skills you learn under the ice carry over into everyday dive technique, providing yet another store of vital knowledge to draw on. Add ice diving to any cave and wreck expertise you already have, and you're that much better prepared to act when the chips are down and it's time to keep yourself alive.

## Getting Under Sea Ice

Most of the Arctic Ocean is covered with sea ice, which forms each fall and grows over the cold winter months until it's a few feet thick. This ice covers shipwrecks, walls teeming with stationary life, and unique fish and animals that combine to make for exceptional diving.

Summer brings warm temperatures to these glacial waters, which can reach the mid-50's (15°C) as the air warms. It takes months for the ice to thin, but when it does, the topside environment is actually quite pleasant and comfortable - air temperatures are higher than they are at lower latitudes during the winter, making for more temperate pre-dive preparation.





Gaining entry to the icy domain below, however, can be significantly more difficult than in southern regions. The ice up north varies from less than a foot to over 10' in depth; at the thick end, it can render traditional ice-cutting techniques difficult to pull off. Although long chainsaws and ice augers can still work, the labor required is heavy, and salt water rapidly corrodes chainsaws (making for some expensive holes).

A water heater can slice down through thicker ice using steam shot through a circular metal tube, which in turn melts a cylindrical core or plug free. That plug is then pushed down and out of the way under the ice. In places where the ice is truly heavy duty, a large, stove element-shaped coil is used to blow through the entire column. This process takes longer and requires a lot of energy, but it may be the only option when the steamed plug would be too large to push under and too heavy to pull out.

The best-case scenario is obviously to spare this hardware and find a natural opening. Luckily, there is now shortage of these cracks and crevasses; they range from seal holes to immense fissures, and provide a far less difficult passage into the icy abyss. You can also search out the floe edge, where ocean and ice meet.

### Between Pack and Sea

In the summer, as the thick sea ice thins slightly, increasing temperatures as stress from wave action forms cracks called leads. The leads expand, and eventually huge sheets of ice break from the pack and drift away. The ice beach left in their wake is known as the floe edge.

Just as a sand beach divides land from sea, the floe edge marks the boundary between pack ice and open ocean. Immediately beyond this edge lies the vast Arctic, while behind it, solid sea ice extends all the way to dry land. Unlike the seashore, the floe edge does not mark the beginning of gradual, standard depth increments, either of water or ice. Rather, it is a fluid boundary in a fluid environment, one that changes and even disappears when the mercury gets too high.

The floe edge may sit over thousands of feet of water, and can range from a few inches thick to a wall-like shelf dropping over 2-3'. After a long winder, the sea ice leading to the edge is thick enough to support significant weight, and it's possible to reach it by snowmobile. But as seasons roll on and new ice sheets separate and float away, a fresh, less sturdy edge forms behind them, making transportation a bit trickier. As breakup progresses even further and the floe moves ever closer to shore, the ice cover gets thinner and shorter, until it disappears completely.

In their developed stages, however, floe edges provide an easy entry point for ice divers, as well as a perfect balance between open-ocean and under-ice possibilities. Those looking for crystal-ceiling excursions can go in at the edge and move under it to the world beneath the pack; on the other hand, divers more comfortable in open water can admire the ice from beneath the waves without venturing too close. From either vantage point, you'll see the contoured underside of the ice, the sea floor below, and maybe even the whales that migrate along the floe edge and occasionally swim under the ice in search of breathing holes.

The world you'll find at the floe edge is both beautiful and rewarding. Brilliant, refracted sunlight through the ice differentiates open water from the pack, much as light zones indicate the openings of caverns. As it drops into the depths, it can create brilliant, sparkling walls of ice, providing beautiful photographic backdrops. Happen by at the right time, and you might snap a shot of those whales, or find yourself in the middle of frolicking seals.

As with any technical diving situation, however, divers exploring under ice must keep their heads on to avoid problems. Those who venture far under the ice from the floe edge must use surface-tended ropes to keep them from inadvertently venturing past the point where open water is no longer obviously visible. Compasses in the Arctic are unreadable, rendering these lines all the more necessary. Even divers intending to stay in open water should use surface tethers, to ensure that the current does not pull them under the ice.

### Leads

Leads are cracks in the ice that can extend for dozens of miles and vary in width from a few inches to many meters wide. They provide easy access for divers along their entire length, and are by far the most favorable and immediately accessible way to enter the waters below. The one significant issue that divers and support crew must consider when diving leads is expansion and, more critically, contraction of the lead as the tide rises and falls. Leads expand and contract steadily throughout the day, and may vary significantly between the time a diver enters the water and the time they decide to exit. Diving through a narrow lead is a big no-no unless you can find an alternate exit nearby; slip through a narrow crevasse at the wrong time, and you might not find it open when you get back.





## Rough Ice

In the late fall, after the ice has begun to form, frequent and very severe storms whip up the ocean, breaking the new ice up into car-sized hunks. The winds and waves push these chunks towards land, where they eventually pile up. The weight of this stacked ice forces the bottom stuff far below the surface, and as winter progressed, the piles freeze together to form what is called rough ice. Fields of rough ice offer stunning formations both above and below the surface, as the random ice creates one-of-a-kind scenery. Unfortunately, there are some little drawbacks, too-rough ice is impassable unless you're on foot, for one thing. For another, large, hungry, swimming polar bears tend to congregate there to hide their movements.

You should be able to avoid these problems, though. Just as the floe edge marks a definite line between ice and water, rough ice also has a definite boundary: the area where flat sea ice has formed since the storms dies out. It is possible to travel along this seam relatively easily, and occasionally find a lead offering entry to the twisted ice tunnels below. Obviously, diving these tunnels requires cave diving experience in addition to ice training (though open water under rough ice requires no special preparation beyond basic ice diving skills). The rewards for diving these tunnels are the stuff of imagination - jumbled, frozen mazes can wind you over 60' under the surface, and combined with rays of reflected sunlight, the view down there is absolutely spectacular. Bring your camera at all costs.

## Old Ice

The polar ice cap is permanent ice that is too thick to melt during the brief summer months. It is found only in the high Arctic, and years of currents and waves have rendered it much more contoured than seasonal sea ice. Although diving old ice is visually interesting, it has virtually no animal life under it, as marine animals depend upon regular access to the water for feeding, and whales cannot swim where the ice does not break. Access is also fairly difficult, as leads are more prevalent in outlying sea ice than they are in ancient ice many yards thick.

## Glacier Pools & Ice Caves

Glaciers form when masses of snow move down mountains and concentrate in valleys, where they continue to flow until they meet the sea. Glaciers can be thousands of feet thick and hundreds of miles long, and they are one of nature's most powerful, awe-inspiring phenomena.

As summer temperatures rise, outer layers of snow melt and begin flowing along the glacier. Streams combine to form rivers, which in turn flow down into the glacier and burrow large tunnels through the ice. Occasionally, this flow is restricted and backs up, thereby creating large pools within the glacier. The pools may collect on the surface if the tunnels are filled, or they may form deep inside as incredible glass bubbles. These sanctuaries of ice offer dramatic diving, but are among the most dangerous ice diving destinations; the stoppages that form them can break without warnings, causing torrential movements of water through the glacier. Diving these pools or exploring the submerged tunnels below them requires ice diving harnesses rigged with climbing rope, which is then anchored with multiple ice screws. This setup lets the surface crew hold and retrieve divers into the unlikely but potentially disastrous "unplugging" scenario. Surface tenders must be anchored, and use ice climbing techniques and equipment such as crampons (spiked soles) or ice axes to move over the slippery glacier.

## Icebergs

Icebergs are towering mountains of ice that have broken off of glaciers. They vary in size from that of a small building to Rhode Island-sized behemoths. As the old adage goes, over 90% of an iceberg's mass hangs underwater. That's the danger factor for ships, and the interesting part as far as divers are concerned: it's where years of ocean currents have created amazing formations, carving the massive islands of ice into delicate caves, spires, and bubbles.

Occasionally, icebergs flip over, revealing these formations to the world above. Unfortunately, this is the worst possible scenario for people and boats that might be near the berg's surface mass, and for divers who might be exploring underneath it. Imagine a chunk of land the size of a small city falling on top of you with uncontrollable rapidity, and you get some idea of this danger. One recent expedition did succeed in exploring ice caves under an Antarctic iceberg, but the extraordinary dangers make this sort of endeavor for too risky to emulate on a regular basis.

Still, safe iceberg diving is actually possible under a few circumstances. Icebergs float progressively south over many years, and regularly run aground in inlets when tides drop or currents and wind push them there. These groundings can happen far from shore, as icebergs drop hundreds of feet beneath the surface. Bergs that run aground in the fall may be frozen into the sea ice and locked in for the winter, both vertically by the sea floor and horizontally by the surrounding ice. Since icebergs are composed of pure water, rather than seawater, the sea ice rarely bonds with the berg itself, and a thin skirt of water normally remains around a frozen-in iceberg.





Such rare circumstances allow divers to explore the gargantuan walls of ice around the berg, as weak as its formations, in much greater safety. The sea ice holds it in place and prevents tipping, while the sea floor exerts pressure on the iceberg's lower regions, also helping to prevent disastrous flips. Only under such circumstances can most divers - and human beings in general - look up-close at such a massive example of nature's power without the threat of swift, instant death looming over them.

## Ice Gear

A quick word on gear: ice diving in polar regions demands the highest quality of equipment, along with specific and frequent servicing for extreme cold water use. Redundancy, whether by using H or Y valves with two regulators, a pony bottle, or doubles, is essential, as is using only environmentally sealed regulators with low second-stage pressures to reduce a free flow's chances. Practice isolating free flows is also essential, and a second-stage free flow control valve may assist in rapidly shutting down free flows. As you can imagine, proper insulation is essential to enjoying ice diving, and wearing many layers is the best way to maintain complete comfort. Carry a hammerhead underwater signaling device (DiveAlert), as it can be a useful tool for alerting surface tenders of problems around rough ice, stactites, or anywhere that contoured ice may inadvertently confuse rope signals. The surface team can easily hear the sound using a hydrophone (Aquarian Audio).

The Arctic and Antarctic offer that most rare of diving commodities: completely new and different experiences. Exploration in the icy realms requires determination, but promises to reward adventure seekers with fuel for their curiosity, experiences that focus the mind, and all the visual wonders a new world of crystal and life can bring.

