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ABC OF DIVING IN CANADA

W artykule omówiono strukturę organizacyjną nurkowania w Kanadzie. Przedstawiono najciekawsze miejsca nurkowe, stosowany sprzęt, tabele dekompresji oraz producentów sprzętu nurkowego i środki medycyny hiperbarycznej.

INTRODUCTION

Diving in Canada is an extremely popular recreational sport. There are many careers in diving. The federal government employs divers for fisheries, public safety diving, police, and the military. Commercial divers work both in-shore and offshore, doing a variety of things from seafood harvesting through to oil and gas exploration. Diving is such a natural activity in Canada that has almost ten percent of the world's freshwater supply, a quarter of a million kilometres of coastline and close to two million square kilometres of lakes and wetlands.

1. PLACES TO DIVE IN CANADA

Canada has an unlimited number of places to dive, and a vast variety of excellent dive sites. The huge expanse of the country touches three salt-water oceans (Pacific, Atlantic and Arctic), the Great Lakes, countless other clean freshwater lakes (popular for training), and an infinite number of islands. In Canada there are several large rivers and many smaller rivers. Most nonpolluted rivers with more than three metres of water are used for diving, also bays, quarries and ponds. There are popular dive sites along just about every shore.

The most popular places to dive in Canada include:

British Columbia

- inland lakes and rivers
- West coast, Pacific Ocean
- Vancouver Island
- Pacific Rim National Underwater Marine Sanctuary
- several artificial reefs that are scuttled destroyers such as the ex-HMCS SASKATHEWAN which is off Nanaimo

Prairie Provinces: Alberta, Saskatchewan, Manitoba

- in the mountain lakes, such as jasper, and Banff
- other lakes, Cold Lake, Alberta
- thousands of lakes in Manitoba and Saskatchewan
- dive with beluga whales in Churchill, Manitoba

Ontario

- The Great Lakes, many other lakes, rivers and quarries
- St Lawrence River, Thousand Island area

- specialized diving destinations like: Tobermory Five Fathoms Park

Quebec

- St Lawrence River
- Les Escoumins, about 30 kilometres east of the Saguenay river
- Saguenay Saint-Lawrence Marine Park
- wreck of the EMPRESS OF IRELAND off Rimouski
- Gaspé area (Forillon National Park and Percé)
- Mingan Islands, and the Magdalen Islands
- Thetford Mines quarry, Flintkote

Maritimes: New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island

- Atlantic Ocean
- Halifax Harbour and approaches
- ex-HMCS SAGUENAY artificial reef
- Fortress of Louisbourg
- Cape Breton
- St Paul's island
- Scatarie Island
- Bay of Fundy
- four Bell Island shipwrecks

Yukon and Northwest Territories

- Arctic Ocean, Hudson's Bay, many lakes and rivers

2. CANADIAN DIVERS

There are three major certifying agencies for recreational diving: American Canadian Underwater Certification (ACUC); National Association of Underwater Instructors (NAUI); and the Professional Association Diving Instructors (PADI). Several smaller more specialized organizations include the LifeGuard Systems (LGS), International Association of Nitrox and Technical Divers (IANTD), and National Association of Scuba Diving Schools (NASDS). With these different training agencies, it is difficult to determine the exact number of divers in Canada.

In Ontario alone, there are over 25,000 certified recreational divers, with a majority living in the Greater Toronto Area. In Nova Scotia there are about 2,000 active divers. Approximately 20,000 people are certified as divers in Newfoundland; however, many of them are not active divers. Including the government, commercial, scientific, public safety and recreational divers, there are about a quarter of a million divers in Canada.

3. DECOMPRESSION TABLES

Canadian sport divers use various decompression tables. Normally tables are used to plan dives that do not involve decompression stops. Newlycertified recreational divers will use the tables that they were taught on course. The most commonly used are produced by: Defence and Civil Institute of Environmental Medicine (DCIEM); Professional Association of Diving Instructors (PADI); or National Association of Underwater Instructors (NAUI). Technical divers also use more sophisticated tables that are often generated by computer software.

Decompression computers are rapidly gaining popularity with recreational divers in Canada. Some sport divers do not use tables and rely completely on their dive

computers. The more serious technical divers wear Nitrox compatible and programmable computers.

4. AIR AND OTHER GASES USED

Ninety-nine percent of Canadian recreational divers use regular Canadian Standards Association grade „E” compressed air. Nitrox (nitrogen and oxygen) or Enriched Air Nitrox (EAN) of various mixtures, most commonly, N1 (32 percent oxygen) and N2 (36 percent oxygen), are becoming more readily available.

Very few recreational divers use trimix, because the training is not yet commonly available, and the gas costs more than compressed air. A small number of dedicated technical divers use trimix for deeper and more demanding dives, such as long deep cave penetrations. Among advanced-nitrox-trained divers, oxygen is gaining popularity as a decompression gas. When helium is used instead of air in the breathing mixture, some technical divers use argon gas for drysuit inflation.

5. CANADIAN HEALTH QUALIFICATION PROCEDURES

Each certifying agency sets its own medical standards. generally, all that is required is a simple medical clearance from a General Practitioner. One association's requirements to participate in a SCUBA class are that the candidate be in good average health and at least 12 years old. They also ask the candidate to complete a routine medical questionnaire. If anything on the questionnaire is questionable, the candidate is required to check with their physician to make sure he is acceptable to dive.

Other agencies require the student to complete a Medical Form. It contains questions about the Diver's medical history, asking questions about specific conditions. The physician then completes and signs a „Diving Fitness Examination” that lists conditions which are absolute contraindications to diving. Any licensed medical doctor can complete the medical examination; however, in Canada there are medical doctors trained in the hyperbaric medicine field who are available to the recreational diver throughout the country.

The Defence and Civil Institute of Environmental Medicine has been training military medical personnel, both Doctors and Physicians Assistants, on Basic and Advanced Diving Medicine courses. Medical personnel from Canada and other countries attend these courses.

6. CANADIAN COURSES FOR CIVILIAN DIVING INSTRUCTORS

All civilian certifying agencies offer several levels of instructor qualification. These range from Teaching Assistant, Open Water Scuba Instructor, through to Instructor Trainer and eventually Course Director.

There are more advanced instructor qualifications, such as: Medic First Aid Instructor, Specialty Instructor, Master SCUBA diver Trainer, Instructor Development Course Staff Instructor, Medic First Aid Instructor Trainer, and Specialty Instructor Trainer. The technical diving agencies offer Instructor and Instructor Trainer Levels, such as: Nitrox, deep Air, Trimix, Rebreather and Gas Blending. The Canadian Forces does not train civilian diving instructors.

7. CANADIAN HYPERBARIC FACILITIES

Civilian hyperbaric facilities are located in large hospitals in the major Canadian cities. With the excellent access to a variety of highly trained medical professionals, they are in an ideal location to be used for the complete variety of Hyperbaric Oxygen (HBO) therapies including decompression illness.

There are chambers located in the most common diving areas of Canada. As well, several hyperbaric centres are located in smaller clinical centres, or educational institutions. Not included in this list are the chamber facilities used by commercial diving companies and diving training centres in Canada. Military recompression chambers are not normally used to treat civilians.

8. LOCATION OF CANADIAN HYPERBARIC CENTRES

Canadian hyperbaric centres, which treat civilians, are found in the following locations:

- vancouver General Hospital, Vancouver, British Columbia
- Misericordia Hospital, Edmonton, Alberta
- HBO Therapy Clinic, Calgary, Alberta
- Firefighters Hyperbaric Unit, Moose Jaw Hospital, Alberta
- Tobermory Hyperbaric Facility, Medical Clinic, Tobermory, Ontario
- Firefighters Hyperbaric Chamber, Hamilton General Hospital, Ontario
- Toronto General Hospital, Toronto, Ontario
- Ottawa General Hospital, Ottawa, Ontario
- Hôpital du sacré-Coeur de Montréal, Montreal, Quebec
- Institut Maritime du Quebec, Rimouski, Quebec
- Victoria General Hospital, Halifax, Nova Scotia
- Centre for Offshore and Remote Medicine (MEDICOR), Heath Science centre, St John's, Newfoundland

The following are military chambers that do not normally treat civilians:

- Fleet Diving Unit (Pacific), Victoria, British Columbia
- Canadian Forces School of Aeronautical Training, Winnipeg, Manitoba
- Experimental Diving Unit, DCIEM, Toronto, Ontario
- Fleet Diving Unit (Atlantic), Halifax, Nova Scotia

9. CIVILIAN DIVING ACCIDENTS

It is difficult to state the number of civilian diving accidents in Canada each year as there is no federal government agency that monitors diving, and keeps detailed statistics. Two studies state that there are approximately three diving related deaths per year in two of the provinces. If this is a trend that applies to all provinces, it would indicate that there should be less than thirty recreational sport divers killed each year in Canada.

The number of recreational sport divers who suffer from DCS or AGE is also very difficult to state. There is no requirement for divers to report any minor sickness or accidents; therefore, it is almost impossible to know how many diving accidents there are, since many are never declared. Even mild, Type I decompression sickness is misdiagnosed. Commercial (including seafood harvesters), government (DND, RCMP, DFO/CCG) and scientific divers have several accidents per year. Medical treatment of bends is about 15 cases per year, due to some fisheries-related harvesting dives which often exceed the recommended decompression limits. Generally, there are very few fatalities due to sport diving; on the other hand, most accidents and incidents are unreported.

10. POPULAR DIVING EQUIPMENT

Open-circuit Self-Contained Underwater Breathing Apparatus or SCUBA is the most popular type of diving equipment used by the average civilian diver. During the initial or basic diving course, divers are normally required to buy mask, fins, snorkel, weight-belt, and sometimes neoprene boot or gloves.

The basic SCUBA setup is normally a single aluminum cylinder, with a floodable volume of 11 litres (80 cubic feet) and a working pressure of 205 bar (3000 psig), a single hose regulator with an octopus second stage and a minimum of an submersible pressure gauge with a buoyancy compensator. A console with a bottom timer or decompression computer is becoming very common with Canadian divers. The jacket style buoyancy compensator is the common type worn. Technical and advanced recreational divers often use the back-mounted style of buoyancy compensator. In the cold Canadian water, using a regulator with an anti-freeze kit on the first stage, is highly recommended.

The most common brand names used in Canada appear to be Aqualung, Dacor, Scubapro, Sherwood, and others like Brooks, Poseidon, Whites, etc. Most divers in Canada wear a sixmillimetre neoprene wetsuit, with hood, gloves, and boots. Drysuits are very popular, and most „serious” divers, government, commercial and recreational, use a drysuit if they do more than a few dives each year.

Government, commercial and the serious advanced recreational divers or some technical divers will use a full facemask and through-water communications, such the OTS Buddyphone on an Interspiro full facemask. Simple „nitrox” rebreathers are being taught, however, very few individuals in Canada have purchased their own rebreather.

Large international diving equipment manufacturers have regional headquarters in Canada, such as Aqua-Lung Canada. There are several Canadian companies that specialize in manufacturing equipment for divers:

- Amphibico Incorporated underwater housings for cameras,
- Binky Dives - cards, posters and shirts with diving themes,
- Bonica Precision Incorporated - underwater camera, decompression computer,
- Brooks Wetsuits Limited - wetsuits and drysuits and accessories,
- Delta Temax Incorporated - diver-wom hot water heating system,
- Fullerton Sherwood Division – Carleton - rebreathers, diving systems, diving, chambers,
- Mustang Survival Corporation - surface personal flotation devices,
- Oceaner Sporting Goods Canada Inc. - wetsuits and drysuits and accessories,
- Orcatron Communications Limited....through water communications,
- Sea-tux Diving Company - wetsuits and drysuits,
- Whites Manufacturing Limited - drysuits and accessories

11. DIVING WITHIN THE DEFENCE AND CIVIL INSTITUTE OF ENVIRONMENTAL MEDICINE

The Experimental Diving Unit within the Defence and Civil Institute of Environmental Medicine is engaged in support of the Canadian Forces Subsea Intervention capability. Experimental Diving Unit facilities are also capable of supporting the needs of other NATO countries, Canadian industry, and other Government Departments.

The Facilities for Subsea research are extensive and unique in Canada. In addition to an unmanned test chamber (300 metres), there is a Diving Training Facility, which

can be pressurized to 113metres seawater equivalent, and a Diving Research Facility, which can dive to 1700 metres. The 1700 metre facility is one of the deepest man-rated chambers in the world. It has supported verydeep diving, including a thirty-day, 360-metre international saturation dive. Thhe main use however is for research and development of equipment and procedures for diving between zero and one hundred metres. These facilities provide scientists and operational naval personnel with the necessary tools for investigating the performance of humans and equipment in the subsea environment.

The CUMA (Canadian Underwater Mine-countermeasures Apparatus), and the Canadian Clearance Diving Apparatus (CCDA), were designed and developed by the Experimental Diving Unit for mine-countermeasures. Under the commercial names of SIVA₊ and SIVA, respectively, these rebreathers have been sold to several Navies abroad, with many more countries expressing interest in Canadian rebreathers. Diver performance in a cold water minecountermeasures environment is thesubject of research with a unique Canadian-made hot water heating system that is currentlyunder development. The extension of the Canadian Forces Mine-Countermeasures capability is an ongoing project along with evaluation of other subsea intervention systems.

The Experimental Diving Unit has also received global recognition for development of perhaps the world's safest dive tables, the Defence and Civil Institute of Environmental Medicine (DCIEM) Air Diving Tables. These tables are in use with the Canadian Forces (CF) as the CF Air Diving Tables. Doppler ultrasonic monitoring of bubbles formed in divers during decompression has been extensively developed and used at DCIEM. In recent years, many other countries have sent personnel to be trained on by Doppler ultrasonic monitoring to detect bubbles in the bloodstream. Decompression studies helium-oxygen mixtures are also underway, in particular, repetitive experimental dives using the CUMA helium-oxygen rebreather with a short surface interval.

The main purpose of Experimental Diving Unit is to support military Subsea Intervention requirements, but the capability to support industry and other Government Departments exists and has been used regularly in the past. An extensive network of NATO and other international contacts is maintained. DCIEM facilities are available under agreements to other national governments and government agencies or under contract to civilian and commercial organizations.

ACRONYMS USED IN CANADIAN DIVING

ADS	Atmosphere Diving Systems
AGE	arterial gas embolism
BC	buoyancy compensator
CCDA	Canadian Clearance Diving Apparatus
CUMA	Canadian Underwater Mine-countermeasures Apparatus
DCI	decompression illness
DCS	decompression sickness
DRF	Diving Research Facility
DTF	Diving Training Facility
EAN or EANx	enriched air nitrox
HBO	hyperbaric oxygen
MCM	mine countermeasures
MSW	metres of sea water
N1 or N2	Nitrox mix of 32 percent oxygen or 36 percent oxygen
O2	oxygen
psig	pounds per square inch, gauge

RCC	recompression chamber complex
ROV	Remotely Operated Vehicle
SCUBA	self-contained underwater breathing apparatus
SPG	submersible pressure gauge
UTF	Unmanned test Facility

CANADIAN DIVING and DIVING RELATED AGENCIES

(this list NOT all inclusive)

ACUC	American Canadian Underwater Certification
ANDI	American Nitrox Divers Incorporated
BSAC	British Sub-Aqua Club
CAUS	Canadian Association For Underwater Sciences
CCG	Canadian Coast Guard
CF	Canadian Forces
CMAS	Confederation Mondiale des Activites Subaquatiques
CSA	Canadian Standards Association
DAN	Diver's Alert Network
DCIEM	Defence and Civil Institute of Environmental Medicine
DFO	Department of Fisheries and Oceans
DND	Department of National Defence
EDU	Experimental Diving Unit
ESDA	Emergency Services Diving Association
HSA	Handicapped Scuba Association
IANTD	International Association of Nitrox and Technical Divers
IDA	International Diving Association
IDEA	International Diving Educators Association
LGS	LifeGuard Systems Incorporated
NACD	National Association for Cave Diving
NASDS	National Association of Scuba Diving Schools
NATO	North American Treaty Organization
NAUI	National Association of Underwater Instructors
NSS-CDS	National Speleological Society - Cave Diving Section
OPP	Ontario Provincial Police
PADI	Professional Association of Diving Instructors
PDIC	Professional Diving Instructors Corporation
QPP	Quebec Provincial Police
RCMP	Royal Canadian Mounted Police
SSI	Scuba Schools International
TDI	Technical Diving International
UHMS	Undersea Hyperbaric Medical Society

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