THE UNIVERSITY OF MAINE

ORGANIZATIONAL MEMBER OF
THE AMERICAN ACADEMY OF UNDERWATER SCIENCES

STANDARDS FOR SCIENTIFIC DIVING

Revised April 2022

TABLE OF CONTENTS

Section	Page
Forward	4
Acknowledgments	4
Adoption and Approval	4
Revision History	6
1 General Policy	7
1.1 Scientific Diving Standards	7
1.2 Operational Control	8
1.3 Consequence of Violation of Regulations by Scientific Divers	11
1.4 Consequences of Violation of Regulations by Organizational Members	11
1.5 Record Maintenance	11
2 Diving Regulations	13
2.1 Introduction	13
2.2 Pre-Dive Procedures	13
2.3 Diving Procedures	14
2.4 Post-Dive Procedures	15
2.5 Emergency Procedures	15
2.6 Flying After Diving or Ascending to Altitude (Over 1000 feet)	15
2.7 Record Keeping Requirements	15
2.8 Boat Diving	16
3 Diving Equipment	17
3.1 General Policy	17
3.2 Equipment	17
3.3 Auxiliary Equipment	18
3.4 Support Equipment	19
3.5 Equipment Maintenance	19
3.6 Air Quality Standards	20
4 Scientific Diver Training, Certification, and Authorization	21
4.1 Prerequisites	21
4.2 Scientific Diver Training	22
4.3 Scientific Diver Certification and Authorization	24
4.4 Depth Authorizations/ Ratings	26
4.5 Maintaining Active Status	28
4.6 Revocation of Certification	28

5 Medical Standards 29
5.1 General Requirements 29
5.2 Medical Evaluations/ Exams 29
6 Nitrox Diving Guidelines 31
6.1 Authorization and Training 31
6.2 Minimum Activity to Maintain Authorization 32
6.3 Operational Requirements 32
6.4 Nitrox Diving Equipment 33
7 Surface Supplied Diving Technologies 34
7.1 Prerequisites 34
7.2 Surface Supplied Diving (Umbilical) 34
7.3 Hookah 34
8 Staged Decompression Diving 36
8.1 Minimum Experience and Training Requirements 36
8.2 Minimum Equipment Requirements 37
8.3 Minimum Operational Requirements 37
9 Mixed Gas Diving 38
9.1 Minimum Experience and Training Requirements 38
9.2 Equipment and Gas Quality Requirements 39
9.3 Minimum Operational Requirements 39
10 Specialized Diving Environments 40
10.1 Blue Water Diving 40
10.2 Ice and Polar Diving 40
10.3 Overhead Environments 40
10.4 Saturation Diving 40
10.5 Aquarium Diving 40
11 Rebreathers 41
12 Scientific Cave and Cavern Diving 42
Appendices 43
Diving Medical Exam Overview for the Examining Physician 44
Medical Evaluation of Fitness for Scuba Diving Report 45
Diving Medical History Form 47
Recommended Physicians with Expertise in Diving Medicine 50
Definition of Terms 51
Reciprocity Request / Verification of Scientific Diver Status 55
Diving Emergency Management Procedures 56

AAUS Statistics Collection Criteria and Definitions 58
Recommendations For Rescue Of A Submerged Unresponsive Compressed-Gas Diver 61
Scientific Diver Information Sheet 62
UMaine Dive Log 65
Dive Checklist / SCUBA 66
Dive Plan 68
Dive Site Description 69
Scientific Diver Application 70
AAUS Dive Computer Guidelines 71
Regulator Service Form 72
Scientific Diver Assumption of Risk, Waiver and Release 73
Scientific Diver Medical Consent and Insurability 74
Verification of Employment for Scientific Divers 75
Dive Plan Flowchart 76
Charter – Diving Control Board, University of Maine System 77

Forward

Since 1951 the scientific diving community has endeavored to promote safe, effective diving through self-imposed diver training and education programs. Over the years, manuals for diving safety have been circulated between organizations, revised and modified for local implementation, and have resulted in an enviable safety record.

This document represents the minimal safety standards for scientific diving at the present day. As diving science progresses so shall this manual, and it is the responsibility of every member of the Academy to see that it always reflects state of the art, safe diving practice.

--American Academy of Underwater Sciences

Acknowledgments

The American Academy of Underwater Sciences thanks the numerous dedicated individual and organizational members for their contributions and editorial comments in the production of these standards.

The University of Maine also thanks these individuals and groups for the comprehensive and continuous effort necessary to produce and maintain high standards and requirements for scientific diving programs.

Adoption and Approval

The University of Maine (UMaine) has adopted the AAUS Standards, designed and written this manual in accordance with such, and developed and implemented policies and procedures which enable and require UMaine scientific divers to meet or exceed these standards.

Representations, Warranties, Assumption of Risk, Release, Hold Harmless and Indemnification of AAUS

By adopting some or all of the standards and policies set forth in this manual, UMaine represents and warrants to AAUS that UMaine has thoroughly reviewed the appropriateness of these standards and policies for its own programs and purposes, that UMaine has made a professionally informed, independent decision that the AAUS standards and policies are in every instance and every detail suitable for the intended use by UMaine, and that UMaine freely and voluntarily makes an informed choice to assume all risks associated with the application and use of these standards and policies in any diving or diving related activities.

By adopting some or all of the standards and policies set forth in this manual, UMaine represents and agrees that UMaine has made a professionally informed decision to release AAUS, and thereby does release AAUS, from any and all losses, costs, injuries, death or damages, including attorney fees, caused in whole or in part by, or resulting in whole or part from, the implementation, use or application of these standards and policies to any diving or diving-related activities, or caused in whole or in part by, or resulting in whole or in part from, acts or omissions of UMaine, its officers, directors, employees, students, volunteers or invitees.

By adopting some or all of the standards and policies set forth in this manual, UMaine represents and agrees that UMaine has made a professionally informed decision to indemnify and hold AAUS

harmless, and thereby does indemnify and hold AAUS harmless from and against any and all claims, actions, lawsuits, judgments and costs, including reasonable attorney's fees, due to bodily injury or property damage caused by the negligent acts or omissions of UMaine or its employees, arising out of or in connection with UMaine's adoption of some or all of the standards and policies set forth in this manual in its diving or diving related activities. This indemnification obligation shall not apply to any claim for which UMaine would not be liable under the Maine Tort Claims Act, (14 M.R.S.A. §8101, et seq.) if such tort claim were made directly against UMaine.

UMaine has taken ownership of this manual replacing 'AAUS OM' with 'UMaine' or where appropriate, but otherwise maintained most AAUS formatting and language. When local policy or procedure differs from or exceeds the AAUS Standards, or in cases when clarification is required, it has been *noted in italics, and highlighted*.

This manual has been reviewed and approved by:

UMaine Diving Control Board	**UMaine Diving Advisory Board**
- Richard Wahle, PhD.; Chair - Emmanuel Boss, PhD. - Robert Steneck, PhD. - Rhian G. Waller, PhD; - Christopher M. Rigaud, M.S.; Diving Safety Officer	- Robert L. Downs - Warren Riess, PhD. - Mark L. Wells, PhD.

Revision History

AAUS made significant revisions to its minimum standards in 2018. A full listing of all revisions will not be presented here, but is available at: www.aaus.org/About/Diving Standards

Accordingly, UMaine made significant revisions to this manual in 2019. A complete listing of revisions prior to 2018 is available in the files of the UMaine Diving Safety Officer. Recent revisions are noted below:

Jan. 2018	Section 6.1- Frequency of Medical Evaluations. Modified to read, "Clearance to return to diving must be obtained from a physician following any major injury or illness, any condition requiring hospital care or chronic medication, or use of disability leave. Section 6.1- Physician's Written Report. Modified to read, "…will be reviewed by the *DSO and/or* DCB Section 2.20 and Appendix 13, Dive Plans. added requirement to state the Scientific Objective/Purpose of the Dive Appendix 21- Dive Plan Flowchart
Feb. 2019	***Incorporate AAUS Revisions (2018) Appendix 22- UMaine DCB Charter

1 General Policy

1.1 Scientific Diving Standards

1.1.1 Purpose

The purpose of these Scientific Diving Standards is to ensure that all scientific diving is conducted in a manner that will maximize protection of scientific divers from accidental injury and/or illness, and to set forth standards for training and certification which will allow a working reciprocity between AAUS Organizational Members (OMs or OM). Fulfillment of these purposes shall be consistent with the furtherance of research and safety and facilitation of collaborative opportunities between AAUS OMs.

This manual sets minimum standards for the establishment of the American Academy of Underwater Sciences (AAUS) recognized scientific diving programs, the organization for the conduct of these programs, and the basic regulations and procedures for safety in scientific diving operations. It also establishes a framework for reciprocity between AAUS member organizations which adhere to these minimum standards.

1.1.2 Historical Perspective

The basis for this manual was developed and written by the AAUS by compiling the policies set forth in the diving manuals of several university, private, and governmental scientific diving programs. These programs share a common heritage with the scientific diving program at the Scripps Institution of Oceanography (SIO). Adherence to the SIO standards has proven both feasible and effective in protecting the health and safety of scientific divers since 1954.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29 CFR Part 1910, Subpart T) under certain conditions which are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No. 6, p.1046). AAUS is recognized by OSHA as the scientific diving standard setting organization.

1.1.3 Scientific Diving Definition

Per 29 CFR 1910.402, Scientific diving is defined as: "Diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as". Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding, or the use of explosives."

1.1.4 Scientific Diving Exemption

As further defined in 29 CFR 1910 Subpart T 1910.401(a)(2)(iv), the two elements that a scientific diving program must contain in order to be exempt from the commercial diving standards are:

A. Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; including procedures for emergency care, recompression and evacuation; and the criteria for diver training and certification.

B. Diving control (safety) board, with the majority of its members being active scientific divers, which shall at a minimum have the authority to: approve and monitor diving projects, review and revise the diving safety manual, assure compliance with the manual, certify the depths to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving.

Additional guidelines for scientific diving in 29 CFR 190, Appendix B to Subpart T include:

1. The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.
2. The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.
3. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.
4. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.

1.1.5 Recommendations for Changes to AAUS Standards

As part of each organizational member's annual report, any recommendations for modifications of these standards shall be submitted to the AAUS for consideration.

1.2 Operational Control

1.2.1 Organizational Member Auspices and Responsibilities

OM auspices include any scientific diving operation in which an OM is connected because of ownership of life support equipment used, locations selected, or relationship with the individual(s) concerned. This includes all cases involving the operations of authorized individuals of the OM or auxiliary organizations, where such individuals are acting within the scope of their authorization.

It is the OM responsibility to adhere to the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs. The administration of the local diving program will reside with the OMs Diving Control Board (DCB). The regulations herein must be observed at all locations where scientific diving is conducted.

UMaine Auspices- as of 2018, UMaine Scientific Diving Program auspices include all scientific diving operations at all UMaine System campuses and remote sites whether conducted by employees, students, or visitors. These auspices extend to any scientific diving in which UMaine employees, students, or visitors are engaged in educational or research activities sponsored by, or affiliated with UMaine, regardless of location. As such, the policies and procedures in this manual are applicable to all UMaine diving operations conducted anywhere, not just at UMaine facilities.

Commercial or recreational diving activities performed by UMaine employees, students, and visitors are not covered under these auspices or this manual; however, other special standards and procedures may apply.

1.2.2 Organizational Member Diving Safety Manual

Meeting AAUS minimum standards is a requirement for Organizational Membership in the Academy. Each OM must develop and maintain a diving safety manual that includes wording on how the OM defines specific policies and procedures required for the proper function of a scientific diving program. The manual must address environmental and working conditions unique to the program's operations and must meet or exceed the AAUS standards.

AAUS standards must be the foundation for the development of an OM scientific diving safety manual. The order and formatting of the OM manual does not have to conform to the AAUS template. The information contained in Volume 1, Sections 1.00 through 5.00 and the Appendices are required for all manuals. Volume

2, Sections 6.00 through 12.00 are required only when the OM conducts the specifically referenced diving mode or activity. Deviations or significant changes to AAUS minimum standards may require justification before approval is granted by the AAUS Standards Committee.

UMaine Diving Safety Manual- as previously noted, UMaine has written this manual in accordance with the AAUS Standards and developed and implemented policies and procedures which enable and require UMaine scientific divers to meet or exceed the standards of AAUS.

1.2.3 Diving Control Board

The Diving Control Board (DCB) must consist of a majority of active scientific divers. Voting members include the Diving Safety Officer (DSO), and other representatives of the diving program such as qualified divers and members selected by procedures established by each OM. A chairperson and a secretary may be chosen from the membership of the board according to local procedure.

- The DCB has autonomous and absolute authority over the operation of the Scientific Diving Program.
- Responsibilities of the DCB include:
    - Establish additional standards, protocols, and operational procedures beyond the AAUS minimums to address OM specific needs and concerns.
    - Approve and monitor diving projects.
    - Review and revise the diving safety manual.
    - Ensure compliance with the diving safety manual.
    - Approve the depth to which a diver has been authorized to dive.
    - Take disciplinary action for unsafe practices.
    - Ensure adherence to the buddy system for scientific diving.
    - Act as the official representative of the OM in matters concerning the scientific diving program.
    - Act as a board of appeal to consider diver-related problems.
    - Recommend the issue, reissue, or the revocation of diving authorizations.
    - Recommend changes in policy and amendments to AAUS and the OM diving safety manual as necessary.
    - Establish and/or approve training protocols or standards through which the applicants for authorization can satisfy the requirements of the OM diving safety manual.
    - Suspend diving operations considered to be unsafe or unwise.
    - Establish criteria for equipment selection and use.
    - Recommend new equipment or techniques.
    - Establish and/or approve facilities for the inspection and maintenance of diving and associated equipment.
    - Ensure that the OM air station(s) meet air quality standards as described in Section 3.60.
    - Periodically review the program and DSO performance.
    - Investigate diving incidents within the OM diving program or violations of the OM diving safety manual.

UMaine DCB- UMaine has established and recognized a Diving Control Board which oversees scientific diving at all UMaine System campuses and remote sites. See UMaine DCB Charter, Appendix 22.

1.2.4 Diving Safety Officer

The Diving Safety Officer (DSO) serves as a voting member of the Diving Control Board and should be designated one of the OM representatives to AAUS. This person should have broad technical and scientific expertise in research related diving

DSO Qualifications:

1. Must be an active scuba instructor from an internationally recognized certifying agency.
2. Appointed by the responsible administrative officer or designee, with the advice and counsel of the DCB.
3. Must qualify as a Full Voting Member of AAUS as defined by AAUS Bylaws:
   (a) holds a diving certification from a recognized national certifying agency or equivalent, and
   (b) has engaged in sustained or successive scientific diving activities during the past two years, or
   (c) has completed a course in scientific diving that meets the requirements as specified by the most current edition of the AAUS Standards for Scientific Diving.
4. Must attend an AAUS DSO Orientation within one year of accepting a position at an AAUS approved OM, unless having served as a DSO for another current AAUS OM within the last year.

DSO Duties and Responsibilities:

1. Answers, through the DCB, to the appropriate administrative officer or designee, for the conduct of the scientific diving program of the OM.
2. If delegated by the DCB, the routine operational authority for this program rests with the DSO. This oversight includes, but is not limited to: training, diver authorizations, approval of dive plans, maintenance of diving records, and ensuring compliance with this manual.
3. May permit some duties and responsibilities to be performed by a qualified delegate, with DCB approval.
4. Must be guided in the performance of the required duties by the advice of the DCB, but operational responsibility for the conduct of the scientific diving program will be retained by the DSO.
5. Must suspend diving operations determined to be unsafe or unwise.

UMaine DSO- the UMaine DCB has delegated routine operational authority and oversight for this program to the UMaine DSO. The DSO reports to both the DCB and the UMaine System Department of Safety Management.

1.2.5 Instructional Personnel

- *Qualifications- All personnel involved in diving instruction under the auspices of UMaine must be qualified for the type of instruction being offered.*
- *Selection- Instructional personnel will be selected by the responsible administrative officer, or designee, who will solicit the advice of the DCB in screening of applicants for instructional positions.*

1.2.6 Lead Diver

For each dive, one individual shall be designated as the Lead Diver. The Lead Diver shall be at the dive location during the diving operation. The Lead Diver shall be responsible for:

- Ensuring dives are conducted accordance with Section 2.2
- Ensuring all dive team members possess current certification, proper equipment, and are qualified for the type of diving operation.
- Coordination with other known activities in the vicinity which are likely to interfere with diving operations.
- Ensuring safety and emergency equipment is in working order and at the dive site.
- Suspending diving operations if in their opinion conditions are not safe.

At UMaine the Lead Diver must be certified as a UMaine Scientific Diver. In order to avoid potential conflicts of interest and distribute responsibility, the Lead Diver will not normally be the primary scientific investigator (PI). One individual may serve both roles if no other divers are qualified to serve in the role of Lead Diver, and if approved in the Dive Plan. Additional responsibilities of Lead Divers at UMaine include:

- *Ensuring information concerning dive profiles is documented at the dive site.*
- *Reviewing all dive logs prior to submission for accuracy and completeness.*
- *Ensuring adequate supervision of Divers-in-Training.*

1.2.7 Reciprocity and Visiting Scientific Diver

- Two or more AAUS OMs engaged jointly in diving activities, or engaged jointly in the use of diving resources, must designate one of the participating DCB to govern the joint dive project.
- A scientific diver from one OM must apply for permission to dive under the auspices of another OM by submitting to the DSO of the host OM a document containing all the information described in Appendix 6, signed by the DSO or designee.
- A visiting scientific diver may be asked to demonstrate appropriate knowledge and skills for the planned diving.
- If a host OM denies a visiting scientific diver permission to dive, the host DCB must notify the visiting scientific diver and DCB with an explanation for the reasons for denial.
- *At UMaine, joint diving operations may also be governed by an inter-institutional Memorandum of Understanding.*

1.2.8 Waiver of Requirements

The OM DCB may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification. AAUS Medical Standards may not be waived.

1.3 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the regulations of the OMs diving safety manual may be cause for the restriction or revocation of the diver's scientific diving authorization by action of the OM DCB.

1.4 Consequences of Violation of Regulations by Organizational Members

Failure to comply with the regulations of this standard may be cause for the restriction or revocation of the OM recognition by the AAUS.

1.5 Record Maintenance

Each OM must maintain consistent records for its diving program and for each participant. These records include but are not limited to: diving safety manual; equipment inspection, testing, and maintenance records; dive plans (project and/or individual); records of dive (project and/or individual); medical approval to dive; diver training records; diver authorization(s); individual dive log; dive incident reports; reports of disciplinary actions by the DCB; and other pertinent information deemed necessary by the OM.

At UMaine, record maintenance is the responsibility of the Diving Safety Officer, unless otherwise noted.

<u>Availability of Records</u>

- Medical records must be available to the attending physician of a diver or former diver when released in writing by the diver.

- Records and documents required by this manual must be retained by the OM for the following periods:
    - Diving safety manual – Current document only.
    - Equipment inspection, testing, and maintenance records – Minimum current entry or tag.
    - Records of Dive – minimum of 1 year; 5 years where there has been an incident of pressure-related injury, *30 years at UMaine.*
    - Medical approval to dive – Minimum of 1 year past the expiration of the current document; 5 years where there has been an incident of pressure-related injury, *30 years at UMaine.*
    - Diver training records – Minimum of 1 year beyond the life of the diver's program participation.
    - Diver authorization(s) – Minimum of 1 year beyond the life of the diver's program participation.
    - Pressure-related injury assessment - 5 years, *30 years at UMaine.*
    - Reports of disciplinary actions by the DCB – Minimum of 1 year beyond the life of the diver's program participation.

2 Diving Regulations

2.1 Introduction

No person shall engage in scientific diving operations under the auspices of the UMaine scientific diving program unless he/she holds a current certification issued pursuant to the provisions of this manual.

2.2 Pre-Dive Procedures

2.2.1 Dive Plans

Before conducting any diving operations under the auspices of UMaine, a Dive Plan for the proposed project or dive must be formulated and submitted by the Lead Diver. Dives should be planned around the competency of the least experienced diver. The dive plan (project or individual) should include the following:

- Scientific Objective/ Purpose of the Dives
- Diving Mode(s) and Gas(es)
- Diver authorizations/qualifications
- Approximate number of proposed dives
- Location(s) of proposed dives
- Estimated depth(s) and bottom time(s) anticipated
- Means for calculating decompression status and/or repetitive dive plans
- Proposed work, equipment, and boats to be employed
- Any hazardous conditions anticipated
- Emergency Action Plan (Appendix 7)

2.2.2 Dive Plan Submission and Review

At UMaine, Dive Plans must be submitted to the DSO for review and approval prior to commencement of diving activities. During review of the Dive Plan, the DSO may require additional details, elements, or procedures which exceed the minimum standards of AAUS or as described in this manual, and/or request additional review and approval by the DCB. As such, adequate time must be allowed for review, discussion, and revision of dive plans, especially for technically advanced dives and/or plans involving multiple divers, collaboration with other groups, or specialized environments or diving modes (see Appendix 21).

2.2.3 Diver Responsibility and Refusal to Dive

The decision to dive must be that of the diver. The ultimate responsibility for safety rests with the individual diver. It is the diver's responsibility and duty to refuse to dive, without fear of penalty, if in their judgment:

- *conditions are unsafe or unfavorable,*
- *the dive exceeds their level of comfort or training, or*
- *they would be violating the regulations in this manual.*

No dive team member will be required to be exposed to hyperbaric conditions against his/her will. No dive team member may dive for the duration of any known condition, which is likely to adversely affect the safety and health of the diver or other dive team members.

2.2.4 Pre-dive Safety Checks

- Prior to commencing the dive, the team must assure that every team member is healthy, fit, and trained for the type of dive that is being attempted.

- Each scientific diver must conduct a functional check of their diving equipment in the presence of the dive buddy or tender. They must ensure the equipment is functioning properly and suitable for the type of diving operation being conducted.
- Each diver must have the capability of achieving and maintaining positive buoyancy at the surface.
- Environmental conditions at the site will be evaluated prior to entering the water.

2.2.5 Pre-Dive Briefing

Before conducting any diving operations under the auspices of UMaine, the Lead Diver must brief dive team members regarding the on-site details of the dive plan, including:

- Dive Buddy assignments and tasks
- Goals and objectives of the dive
- Maximum depth(s) and bottom times
- Gas management plan, including turn-pressure/required surfacing pressure
- Entry, exit, descent and ascent procedures
- Potential environmental and operational hazards and mitigations
- Emergency procedures, including methods for diver recall

2.3 Diving Procedures

2.3.1 Solo Diving Prohibition

All diving activities assure adherence to the buddy system. This buddy system is based upon mutual assistance, especially in the case of an emergency.

2.3.2 Decompression Management

- On any given dive, both divers must follow the most conservative dive profile *based upon the individual means by which decompression status is calculated and monitored.*
- A safety stop should be conducted on any dive exceeding 30ft.

2.3.3 Termination of the Dive

- It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever they feel it is unsafe to continue the dive, unless it compromises the safety of another diver already in the water.
- Any dive must be terminated while there is still sufficient cylinder pressure to permit the diver to safely reach the surface, including decompression time, or to safely reach an additional air source at the decompression station.

At UMaine, minimum pressure for dive termination is considered to be 500 psi in 72/80 cu ft tanks for no-decompression dives less than 60 feet; and 1000 psi in 72/80 cu. ft. tanks for depths 60-100 feet. Diving to depths in excess of 100 feet, in black water/zero visibility, or in overhead environments (including mandatory decompression) require each diver to have separate air sources as reserve gas supplies and designate 1/3 of the total gas supply for emergency use.

2.3.4 Emergencies and Deviations from Regulations

Any diver may deviate from the requirements of this manual to the extent necessary to prevent or minimize a situation likely to cause death, serious physical harm, or major environmental damage. A written report of such actions must be submitted to the DSO/DCB explaining the circumstances and justifications.

2.4 Post-Dive Procedures

Post-Dive Safety Checks
After the completion of a dive, each diver shall report any physical problems, symptoms of decompression illness, or equipment malfunctions to the Lead Diver.

2.5 Emergency Procedures

Each OM will develop emergency procedures which follow the standards of care of the community and include procedures and implementation criteria for emergency care, recompression, evacuation and incident reporting.

UMaine has developed a generalized Emergency Action Plan for scientific divers in our region (Appendix 7). Modifications to this plan must made by the Lead Diver depending on the specific conditions and procedures of the chosen dive location/site.

2.6 Flying After Diving or Ascending to Altitude (Over 1000 feet)

Minimum surface intervals for flying after diving:

1. Single No-Decompression Dive- 12 hours.
2. Multiple Dives per Day or Multiple Days of Diving- 18 hours.
3. Dives Requiring Decompression Stops- 24 hours.

Altitude- before ascending to altitude (>1000 ft), divers should follow the appropriate guideline for preflight surface intervals listed above unless the dive planning/decompression procedure has accounted for the increase in elevation.

2.7 Record Keeping Requirements

2.7.1 Personal Diving Log

Each authorized scientific diver must log/record every dive made under the auspices of an AAUS OM, and is encouraged to log all other dives. Details of the submission procedures are left to the discretion of the DSO. The diving log shall include at least the following:

1. Name of diver, buddy, and Lead Diver.
2. Date, time, and location.
3. Diving modes used.
4. General nature of diving activities.
5. Approximate surface and underwater conditions.
6. Maximum depths, bottom time and surface interval time.
7. Diving tables or computers used.
8. Detailed report of any near or actual incidents.

UMaine Paper/Written Dive Log Forms

UMaine will provide Standard Dive Log forms (See Appendix 9) for all divers. Log sheets must be submitted to the DSO to be placed in the diver's permanent file.

UMaine- Submitting electronically

UMaine scientific divers may submit a record of their diving activity electronically, in a format approved by the DSO. Electronic record submission does not eliminate the need to keep a written record of diving activities at the dive site. Written documentation of diving activity must be maintained at the dive site to ensure critical information regarding the dive profile(s) is readily available in the event of diving injury or illness.

2.7.2 Required Incident Reporting

- *UMaine standard procedures for occupational illness/injury reporting, including those required by the State of Maine Bureau of Labor Standards will be followed.*
- All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported to the UMaine DSO/DCB in a timely manner.
- *The DCB must investigate and document any incident of pressure-related injury and prepare a report containing the details below. This report must be retained by the OM with the record of the dive for a period of 5 years, 30 years at UMaine. Additionally, all diving incidents will be reported to AAUS during the annual reporting cycle as prescribed by the AAUS.*

AAUS Incident Report

- Summary of experience of divers involved.
- Location, description of dive site, and description of conditions that led up to incident.
- The circumstances of the incident and the extent of any injuries or illnesses.
- Description of symptoms, including depth and time of onset.
- Description and results of treatment.
- Disposition of case.
- Recommendations to avoid repetition of incident.

2.8 Boat Diving

When diving from a boat at UMaine, a qualified boat operator will remain in the boat, to assist divers and keep off boat traffic, while divers are in the water. The boat operator may also record diver information as described in Section 2.7. Boat operators used in diving operations will be qualified as 'Live Boat Operators' (refer to UMaine Darling Marine Center Marine Operations Manual for more information).

Deviation from this policy must be authorized by the DSO. An adequate mooring in protected waters may be cause to grant this exemption.

Diving from ships or other large vessels may require the use of a chase boat. Determination to be made by the DSO during review of submitted Dive Plan.

3 Diving Equipment

3.1 General Policy

Per AAUS Standards, the OM DCB must establish the minimum equipment configuration for all dives. Minimum required equipment for scientific divers at UMaine is further described in this section and in Appendix 10.

All equipment must be used in accordance with manufacturer recommendations and appropriate for the diving environment, and mission. This determination will be made by the DSO upon examination of the diver's equipment during the diver orientation session, initial checkout dive, and/or by the DSO/DCB upon review of the Dive Plan.

3.2 Equipment

3.2.1 General Diving Equipment

It is generally assumed that all divers will utilize the following equipment to perform diving activities.

- Mask and Fins (snorkels are recommended for most diving operations)
- Exposure Protection appropriate for the environmental conditions.

3.2.2 Scuba Equipment

Unless specifically described in the Dive Plan, all scientific diving at UMaine is performed using standard open-circuit (OC) scuba equipment. Minimum equipment configuration for standard OC scuba at UMaine consists of:

- Regulator
- Buoyancy Compensator Device (BCD)
- Scuba cylinder
- Depth gauge & timing device, and/or Dive Computer
- Weight Systems

Regulators

Standard OC regulator configuration consists of:

- 1st stage
- Primary 2nd stage
- Alternate Air source/ Back-up 2nd stage
- Low-pressure inflator hose for BCD and/or drysuit
- Submersible Pressure Gauge (SPG)
    - A Full-Face Mask may be used in place of the primary 2nd stage
    - *An independent, redundant air-source may be used in place of a back-up 2nd stage.*

Buoyancy Compensator Devices (BCD) and Drysuits

- Divers must be able to use the BCD and/or drysuit to achieve and maintain neutral buoyancy underwater and positive buoyancy at the surface.
- BCDs and dry suits must be equipped with an exhaust valve and an inflation mechanism connected to a gas supply.
- BCDs and dry suits must not be used as a lifting device in lieu of lift bags.
- *At UMaine, divers using variable volume dry suits are required to dive with a BCD as recommended by dry suit manufacturers. Exceptions to this policy must be requested and reviewed in the Dive Plan.*

Scuba Cylinders

- Scuba cylinders must be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders.
- *At UMaine scuba cylinders used for suction sampling must be clearly marked and designated for this purpose. These cylinders may require inspection and testing more frequently than those used for breathing.*
- *At UMaine divers are limited to a depth of 100ft when using single cylinders of ≤ 85 cu. Ft. Dives to deeper depths require higher volume single cylinders and/or independent redundant cylinders.*

Gauges, Timing Devices, and Dive Computers

- Each diver must have an underwater timing device, an approved depth indicator, and an SPG.
- Dive computers may be utilized in place of a depth gauge and timing device, but must be approved by the DSO. If a dive computer is used the diver must use the same computer used on repetitive dives.
- A single depth gauge and timing device or a single dive computer may not be used to monitor decompression status for more than one diver.
- Backup/redundant gauges and timing devices are recommended.

    - Aquarium exceptions- in an aquarium or other manmade structure of a known maximum obtainable depth:
        - A depth indicator is not required, except when a diver's decompression status must be taken into consideration on repetitive dives.
        - The maximum obtainable depth of the aquarium must be used as the diving depth.
        - Only one buddy must be equipped with a timing device.

3.2.3 Calculation/Monitoring of Decompression Status

- Each diver must plan and monitor their dive individually, according to the method employed to calculate decompression status (i.e. depth gauge, timing device, and tables; or Dive Computer).
- *Regardless of the method used to calculate/monitor decompression status, a set of diving tables, approved by the DSO, must be available at the dive location.*
- *A written record of the dive as described in Section 2.7 will be completed at the dive site in a timely manner to ensure an accurate account of the dive profile, particularly for use in an emergency.*

3.2.4 Diver Emergency Equipment

- *Cutting Instrument- each diver must carry a cutting tool appropriate for the diving environment. It is recommended that this tool at minimum be capable of cutting fishing line, fishing net, and synthetic line up to 1-inch in diameter. Redundancy in cutting tools is recommended, particularly when diving in areas that pose high entanglement hazards.*
- *Surface signaling- each diver shall carry an operable whistle for signaling on the surface. High visibility surface markers (i.e. safety sausage/ lift bag) are recommended, but not required.*

3.3 Auxiliary Equipment

Hand held underwater power tools

- Power tools and equipment used underwater shall be specifically approved for this purpose.
- Tools and equipment supplied with power from the surface shall be de-energized before being placed into or retrieved from the water.
- Hand held power tools shall not be supplied with power from the dive location until requested by the diver.

3.4 Support Equipment

3.4.1 First aid supplies

A first aid kit and emergency oxygen appropriate for the dive being conducted must be available at the dive site.

3.4.2 Diver's Flag

- A diver's flag must be displayed prominently whenever required by local laws/protocol, or where water traffic is probable.
- *At UMaine, an Alpha and Sport Diver Flag will be flown, unless local laws/protocols dictate otherwise.*

3.4.3 Compressor Systems - University of Maine Controlled

The following will be considered in design and location of compressor systems:

- Low pressure compressors used to supply air to the diver if equipped with a volume tank must have a check valve on the inlet side, a relief valve, and a drain valve.
- Compressed air systems over 500 psig must have slow-opening shut-off valves.
- All air compressor intakes must be located away from areas containing exhaust or other contaminants.

3.5 Equipment Maintenance

3.5.1 Inspection, Testing, and Service Requirements

- All equipment must be regularly examined by the person using it and serviced according to manufacturer recommendations.
- Equipment that is subjected to extreme usage under adverse conditions should require more frequent testing and maintenance.
- Specific inspection, service, and testing requirements are further described in this section.

Regulators and Gauges

- *Scuba regulators and gauges must be inspected and tested by the user prior to each use first use, and serviced, at minimum, according to manufacturer recommendations.*
- *At UMaine, regulators and gauges must be serviced annually. Annual service must be performed by a qualified scuba equipment technician according to manufacturer recommendations. A record of this service must be submitted to the DSO for inclusion in the diver's records.*

BCDs/Drysuits

- Must be functionally inspected and tested at intervals not to exceed 12 months.

Cylinders

- Scuba cylinders must be hydrostatically tested in accordance with DOT standards (every 5 years for most aluminum and steel cylinders).
- Scuba cylinders must have an internal and external inspection at intervals not to exceed 12 months.
- Scuba cylinder valves must be functionally tested at intervals not to exceed 12 months.

3.5.2 Equipment Maintenance Records

Diving Equipment
Each equipment modification, repair, test, calibration, or maintenance service must be logged, including the date and nature of work performed, serial number of the item (if applicable), and the name of the person performing the work for the following equipment:

- Regulators
- Gauges (SPG, Depth, Timers, and Dive Computers)
- BCDs
- Drysuits
- Scuba cylinders and valves
- Full face masks
- Compressors, air filtration systems, gas control panels, and storage banks
- Surface supplied breathing equipment
- Rebreather systems
- Any additional equipment as determined by the DCB.

Compressor Operation and Air Test Records
Gas analyses and air tests shall be performed on each UMaine-controlled breathing air compressor at regular intervals of no more than 100 hours of operation or six months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained.

3.6 Air Quality Standards

Breathing gas meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1).

CGA Grade E	
Component	**Maximum**
Oxygen	20-22%
Carbon Monoxide	10 PPM/v
Carbon Dioxide	1000 PPM/v
Condensed Hydrocarbons	5 mg/m3
Total Hydrocarbons (Methane)	25 PPM/v
Water Vapor	(2)
Objectionable Odors	None

For breathing air used in conjunction with self-contained breathing apparatus in extreme cold where moisture can condense and freeze, causing the breathing apparatus to malfunction, a dew point not to exceed -50°F (63 pm v/v) or 10 degrees lower than the coldest temperature expected in the area is required.

3.6.1 Remote Operations

For remote site operations using gas sources not controlled by the OM, every effort should be made to verify breathing gas meets the requirements of this standard. If CGA Grade E gas is not verifiable, the DCB must develop a protocol to mitigate risk to the diver. *Any protocols developed by UMaine will be added to this standard upon adoption by the UMaine DCB.*

4 Scientific Diver Training, Certification, and Authorization

This section describes the training and performance standards for AAUS Scientific Divers and represents the minimum required level of knowledge and skills presented in a generalized format. Individual diving programs are encouraged to expand upon and augment these requirements, develop or utilize appropriate educational materials, and optimize instructional programs to suit and reflect their specific needs.

4.1 Prerequisites

4.1.1 Entry Level Diver Training/ Certification

Scientific Diver candidates must, at minimum, show documented proof of diver certification or equivalent from an internationally recognized training agency. AAUS OMs who wish to train and certify entry level divers may do so under the standards of an internationally recognized diver training agency and/or under the minimum guidelines of the most current version of the RSTC/WRSTC and/or ISO entry-level diver standards. Entry level diver training is a prerequisite to AAUS Scientific Diver Training and therefore no part of entry level training may be counted in any way toward scientific diver training.

- "Minimum Course Content for Open Water Diver Certification"- World Recreational Scuba Training Council (WRSTC), www.wrstc.com.
- "Safety related minimum requirements for the training of recreational scuba divers -- Part 2: Level 2 -- Autonomous diver". ISO 24801-2:2007- International Organization for Standardization (ISO)- www.iso.org.

At UMaine, proof of diver certification may be presented upon application or may be earned by enrolling in an entry-level diver training course conducted under UMaine auspices. Entry-level diver training is separate and distinct from the Scientific Diving Program; however, certain prerequisites apply to enrolling in entry-level diver training (i.e. swim-test, UMaine specific applications, legal forms). Presently, entry-level diver training at UMaine is conducted using the standards of one of two international diver training agencies. Although UMaine retains the right to train divers using only the RSTC/WRSTC standards, this is not current practice and would require special consideration and approval of the UMaine DCB.

4.1.2 Administrative Requirements

Scientific diver candidates must complete all administrative and legal documentation required by UMaine. *Required administrative documentation for individual divers can be found on the UMaine Scientific Diving website: www.umaine.edu/scientficdiving.*

4.1.3 Medical Examination

Scientific diver candidates must be medically qualified for diving as described in Section 5.0 and Appendices 1-4 of this manual. AAUS medical standards may not be waived.

4.1.4 Swimming/Watermanship Evaluation

The candidate must demonstrate the following minimum exercises in the presence of the DSO, or other approved designee. All tests are to be performed without swim aids, however, if exposure protection is needed, the applicant must be appropriately weighted to provide for neutral buoyancy.

1. Swim underwater for a distance of 25 yards (23 meters) without surfacing.
2. Swim 400 yards (366 meters) in less than 12 minutes.
3. Tread water for 10 minutes, or 2 minutes without the use of hands.
4. Transport a passive person of equal size a distance of 25 yards (23 meters) in the water.

4.2 Scientific Diver Training

4.2.1 General

The candidate must successfully complete prerequisites, theoretical aspects, practical training, and examinations for a minimum cumulative time of 100 hours and a minimum of 12 open water dives. Theoretical aspects must include principles and activities appropriate to the intended area of scientific study. Formats for meeting the 100 hour training requirement include an OM developed formalized training course, or a combination of formalized and on the job training.

At UMaine, the 100 hour minimum training requirement is best met with a full-semester academic scientific diver training course (SMS324- Introduction to Research Diving). On the job training is available for specialized topics or situations, however, enrollment in the full academic course is preferred. If this is not possible, specific training arrangements must be made with the UMaine DSO.

If a diver's resume provides clear evidence of significant scientific diving experience, the diver can be given credit for meeting portions of the 100 hour course requirements. The DSO/DCB will identify specific overlap between on-the-job training, previous scientific diving training/experience and course requirements, and then determine how any potential deficiencies will be resolved. AAUS OMs may not "test-out" divers, regardless of experience, if they have no previous experience in scientific diving.

Any candidate who does not convince the DSO/DCB, that they possess the necessary judgment, under diving conditions, for the safety of the diver and their buddy, may be denied scientific diving privileges.

4.2.2 Knowledge Development/ Theoretical Training

Required Topics:	**Suggested Topics:**
• Diving Emergency Care Training • CPR & AED • Standard or Basic First Aid • Recognition of DCS and AGE • Field Neurological Exam • Oxygen Administration • Dive Accident Management	Specific Dive Modes (methods of gas delivery) • Open Circuit • Hookah • Surface Supplied diving • Rebreathers (closed and/or semi-closed)
Dive Rescue • To include procedures relevant to OM specific protocols. (See water skills below)	Specialized Breathing Gas • Nitrox • Mixed Gas
Scientific Method	Small Boat Operation
Data Gathering Techniques (Only items specific to area of study required) • Transects and Quadrats • Mapping • Coring • Photography • Tagging • Collecting • Animal Handling • Archaeology • Common Biota • Organism Identification • Behavior • Ecology	Specialized Environments and Conditions • Blue Water Diving • Altitude • Ice and Polar Diving (Cold Water Diving) • Zero Visibility Diving • Polluted Water Diving • Saturation Diving • Decompression Diving • Overhead Environments • Aquarium Diving • Night Diving • Kelp Diving • Strong Current Diving • Potential Entanglement/Entrapment

• Site Selection, Location, and Re-location • Specialized Data Gathering Equipment	• Boat Diving/Live boating
Knowledge Development/Theoretical Training (cont'd)	
Required Topics:	Suggested Topics:
Underwater Navigation	HazCom/ HazMat Training • Chemical Hygiene, Laboratory Safety (Use of Chemicals)
HazMat Training • HP Cylinder Handling	
Decompression Management Tools • Dive Tables • Dive Computers • PC Based Software	Specialized Diving Equipment • Full face mask • Dry Suit • Communications • Dive Propulsion Vehicle (DPV) • SMBs/Lift Bags • Line Reels
AAUS Scientific Diving Regulations and History • Scientific Dive Planning • Coordination with other Agencies • Appropriate Governmental Regulations	
Hazards of breath-hold diving and ascents	
Dive Physics (Beyond entry level scuba)	Other Topics and Techniques as Determined by the DCB
Dive Physiology (Beyond entry level scuba)	
Dive Environments	
Decompression Theory and its Application	

4.2.3 Practical Training / Skill Development

Confined Water	By the completion of training, the trainee must satisfy the DSO or approved designee of their ability to perform the following, at minimum, in a pool or in sheltered water: • Enter water fully equipped for diving • Clear fully flooded face mask • Demonstrate air sharing and ascent using an alternate air source; as both donor and recipient, with and without a face mask • Demonstrate buddy breathing as both donor and recipient; with and without a face mask • Demonstrate understanding of underwater signs and signals • Demonstrate ability to remove and replace equipment while submerged • Demonstrate acceptable watermanship skills for anticipated diving conditions
Open Water Skills	By the completion of training, the trainee must satisfy the DSO, or approved designee, of their ability to perform the following, at minimum, in open water: • Surface dive to a depth of 10 feet (3 meters) without scuba* • Enter and exit water while wearing scuba gear* ^^ • Swim on the surface 400 yards (366 meters) while wearing scuba gear, but not breathing from the scuba unit* • Demonstrate proficiency in air sharing ascent as both donor and receiver* • Demonstrate the ability to maneuver efficiently in the environment, at and below the surface* ^^ • Complete a simulated emergency swimming ascent* • Demonstrate clearing of mask and regulator while submerged* • Underwater communications^^ • Demonstrate ability to achieve and maintain neutral buoyancy while submerged* • Demonstrate techniques of self-rescue and buddy rescue* • Navigate underwater ^ • Plan and execute a dive^ • Demonstrate judgment adequate for safe scientific diving* ^^
	Rescue Skills: • Stressed and panicked diver scenarios

	• Removal of victim from water to shore or boat • Demonstrate simulated in-water mouth-to-mouth resuscitation • Rescue from depth and transport 25 yards (23 meters), as a diver, a passive simulated victim of an accident: surface diver, establish buoyancy, stabilize victim [see "Recommendations For Rescue Of A Submerged Unresponsive Compressed-Gas Diver" – Appendix 9]
	Successfully complete a minimum of 1 checkout dive with the DSO or designee, and at least 11 additional open water dives in a variety of dive sites, for a cumulative surface to surface time of 6 hours. Dives following the checkout dive(s) may be supervised by an active Scientific Diver holding the necessary depth authorization experienced in the type of diving planned, and with the knowledge and permission of the DSO
	The 11 dives (minimum) following the initial checkout dive may be conducted over a variety of depth ranges as specified by the UMaine DCB/DSO. Depth progression may proceed shallower to deeper only after acceptable skills and judgement have been demonstrated, and are not to exceed 100 feet (30 m) during the initial 12 dive cycle.
	* Checkout dive element ^^ Evaluated on all dives ^ Evaluated at some point during the training cycle

4.2.4 Examinations

Equipment	The trainee will be subject to examination/review of: • Personal diving equipment • Task specific equipment • Function and manipulation of dive computer to be employed (if applicable)
Written Exams	The trainee must pass a written examination reviewed and approved by the OM DCB that demonstrates knowledge of at least the following: • Function, care, use, and maintenance of diving equipment • Advanced physics and physiology of diving • Diving regulations • Applicable diving environments • Emergency procedures for OM-specific dive mode(s) and environments, including buoyant ascent and ascent by air sharing • Currently accepted decompression theory and procedures • Proper use of dive tables • Hazards of breath-hold diving and ascents • Planning and supervision of diving operations • Navigation • Diving hazards & mitigations • Cause, symptoms, treatment, and prevention of the following: near drowning, air embolism, hypercapnia, squeezes, oxygen toxicity, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia • Applicable theoretical training and knowledge development from the Required and Suggested Topics (above)

4.3 Scientific Diver Certification and Authorization

All persons engaged in scientific diving at UMaine must be authorized by UMaine pursuant to the provisions of this standard. Only a person diving under the auspices of an AAUS OM is eligible for AAUS Scientific Diver authorization/ certification.

4.3.1 Scientific Diver-In-Training Authorization

Status as a Diver-In-Training (DIT) is an authorization to dive, usable only while it is current and for the purpose intended. This authorization signifies that a diver has completed and been certified as at least an entry level diver through an internationally recognized certifying agency or AAUS scientific diving program, and has the knowledge, skills, and experience necessary to commence and continue training as a scientific diver under supervision, as approved by the DCB/DSO.

DIT status is intended as a temporary authorization to be used while a diver is engaged in training as a scientific diver. While it is intended and recommended for the DIT to have hands-on scientific diver experience during their training progression, DIT status is not intended to substitute for complete Scientific Diver training and certification.

4.3.2 Scientific Diver Certification

Certification as a Scientific Diver signifies a diver has completed all requirements in Section 4.2 and is certified by UMaine to engage in scientific diving without supervision, as approved by the DSO/DCB. Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must convince and demonstrate to the DSO/DCB sufficient skill and proficiency, and possess the necessary judgement for their safety and that of the dive team.

Scientific Diver Authorization

Certification as a Scientific Diver does not automatically authorize a diver to engage in sustained or unrestricted scientific diving activities. Scientific Divers are authorized only when all other requirements are current and up to date (medical exam, emergency care training, minimum diving activity). Additionally, all scientific divers must be approved for the intended operation as described in the Dive Plan.

4.3.3 Scientific Aquarium Diver

Scientific Aquarium Diver is a certification for the diver to participate in scientific diving solely in an aquarium environment. All requirements set forth for Scientific Diver certification must apply, except as follows:

- Practical training must include at least 12 supervised aquarium dives for a cumulative bottom time of 6 hours.
- Training requirements for navigation and 400-yard (366-meter) surface swim in scuba gear may be waived at the discretion of the DCB.

4.3.4 Temporary Diver Authorization

Only a diver not under the auspices of an AAUS OM may be granted a Temporary Diver Authorization. The individual in question must demonstrate proficiency in diving and the ability to contribute measurably to a planned dive. A Temporary Diver Authorization constitutes a waiver of selected requirements of Section 4.0 and is valid only for a limited time, as approved by the DCB/DSO. A Temporary Diver Authorization must be restricted to the planned diving operation and must comply with all other policies, regulations, and standards of this manual, including medical requirements. This authorization is not to be utilized as a repeated mechanism to circumvent existing standards set forth in this manual.

4.4 Depth Authorizations/ Ratings

4.4.1 Depth Authorizations/ Ratings

Depth ratings indicate the maximum depth to which a diver can conduct science unsupervised and supervise other divers holding a lesser depth authorization. A scientific diver requires a valid depth authorization to be considered active.

4.4.2 Progression to Next Depth Level

A diver may be authorized to the next depth level after successfully completing the requirements for that level, and receiving approval from the DSO/DCB.

A. Certification to 30 Foot Depth - Initial permit level, approved upon the successful completion of training listed in Section 4.00 and 5.00.

B. Certification to 60 Foot Depth - A diver holding a 30 foot certificate may be certified to a depth of 60 feet after successfully completing, under supervision, 12 logged training dives to depths between 31 and 60 feet, for a minimum total time of 4 hours.

C. Certification to 100 Foot Depth - A diver holding a 60 foot certificate may be certified to a depth of 100 feet after successfully completing, 4 dives to depths between 61 and 100 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.

D. Certification to 130 Foot Depth - A diver holding a 100 foot certificate may be certified to a depth of 130 feet after successfully completing, 4 dives to depths between 100 and 130 feet. The diver shall also demonstrate proficiency in the use of the appropriate Dive Tables.

E. Certification to 150 Foot Depth - A diver holding a 130 foot certificate may be certified to a depth of 150 feet after successfully completing, 4 dives to depths between 130 and 150 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

F. Certification to 190 Foot Depth - A diver holding a 150 foot certificate may be certified to a depth of 190 feet after successfully completing, 4 dives to depths between 150 and 190 feet. The diver must also demonstrate knowledge of the special problems of deep diving, and of special safety requirements.

Diving on air is not permitted beyond a depth of 190 feet.

G. Authorization to 250 Foot Depth - A diver holding a 190-foot authorization may be authorized to a depth of 250 feet after successfully completing and logging 6 supervised dives to depths between 190 and 250 feet under supervision of a dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements.

H. Authorization to 300 Foot Depth - A diver holding a 250-foot authorization may be authorized to a depth of 300 feet after successfully completing and logging 6 supervised dives to depths between 200 and 250 feet under supervision of dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements.

I. Authorizations deeper than 300 Feet – Depth authorizations deeper than 300 feet progress in 50-foot depth/6 dive increments. A diver holding a 300 foot, or deeper authorization may be authorized to the next depth authorization increment after successfully completing and logging 6 supervised dives under supervision of dive buddy authorized by the DCB. The diver must also demonstrate knowledge of the special problems of deep diving and of special safety requirements.

4.4.3 Exceeding Depth Levels

A diver may exceed their depth authorization when accompanied and supervised by a dive buddy holding a depth authorization equal or greater to the intended depth. Dives must be planned and executed with the permission of the DSO/DCB.

In the event a diver within the OM does not hold an authorization at the desired next level, the DSO/DCB may authorize a required progression or procedure for a diver to attain a deeper authorization. If local conditions do not conform to traditional AAUS depth progressions, the DSO/DCB may devise a reasonable accommodation, however; the total number of dives to obtain a given depth authorization must follow the cumulative number of dives listed above.

4.5 Maintaining Active Status

4.5.1 Minimum Activity to Maintain Authorizations

During any 12-month period, each scientific diver must log a minimum of 12 scientific, scientific training, or proficiency dives. At least one dive must be logged near the maximum depth of the diver's authorization during each 6-month period. Divers authorized to 150 feet or deeper may satisfy these requirements with dives to 130 feet or deeper. Failure to meet these requirements may result in revocation or restriction of authorization by the DSO/DCB.

4.5.2 Requalification of Authorization

Once the initial requirements of Section 4.00 are met, divers whose depth authorization has lapsed due to lack of activity may be requalified by procedures adopted by the DSO/DCB.

4.5.3 Medical Examination

All certified scientific divers must pass a medical examination at the intervals specified in Section 5. A medically cleared diver experiencing any Conditions Which May Disqualify Candidates From Diving (Appendix 1) must receive clearance to return to diving from a physician before resuming diving activities. This medical examination requirement cannot be waived for any diver.

4.5.4 Emergency Care Training

- The scientific diver must hold current training in the following:
- Adult CPR and AED
- Emergency oxygen administration
- First aid for diving accidents

4.6 Revocation of Certification

A scientific diving authorization or certification can be restricted or revoked for cause by the UMaine DSO/DCB. Violations of: regulations set forth in this manual, other University policy/procedure, or poor judgement, may be considered cause.

The diver must be informed of the reasons for revocation and be given an opportunity to present their case to the DCB for review. Divers may be re-authorized or certified after complying with conditions the DSO/DCB may impose.

All outcomes or actions resulting from this review will be documented and become part of the diver's record.

5 Medical Standards

5.1 General Requirements

Prior to engaging in any scientific diving or related training activity, UMaine must verify that individuals have been declared medically fit to engage in diving activities. Diving medical evaluations must be performed by, or under the direction of, a licensed physician. Physicians with experience and training in diving/ undersea medicine are preferred, but not required.

5.2 Medical Evaluations/ Exams

5.2.1 Content of Medical Evaluations

Medical exams must be performed as prescribed by this manual and contain at least the following:

- *Medical History (Appendix 3)*
- *Physical Exam (Appendices 1 and 2).*
- *Applicant release of medical information (Appendix 2)*

5.2.2 Physician's Written Report

Following any medical exam regarding an individual's fitness to dive, UMaine will obtain a written report prepared by the examining physician. UMaine will provide a copy of the medical documentation and evaluation requirements of this standard to the diver candidate and the examining physician. The report must contain:

- *Physician's opinion of the individual's fitness to dive*
- *Recommended restrictions or limitations*
- *Physician's signature*

The physicians written report will be made available to the individual, reviewed by the DSO/DCB or designee, and become part of the diver's record.

5.2.3 Equivalent Medical Exams

Medical exams documented and submitted in other formats may be acceptable if the exam:

- *was conducted within the required period for the diver's age*
- *has been reviewed and found satisfactory by a physician chosen by UMaine.*

5.2.4 Frequency of Medical Exams

Medical exams are required initially and at the intervals specified below

Frequency of Medical Exams

- *Initial Exam*
  - *For all age groups, before a diver may begin diving (Appendix X)*
- *Periodic Exam*
  - *Before Age 40; 5-year intervals*
  - *Age 40-60; 3-year intervals*
  - *After Age 60; 2-year intervals*

Return to Diving

- *Clearance to return to diving must also be obtained following any:*
- *Incidence of any "Conditions Which May Disqualify Candidates From Diving" (Appendix 1)*
- *Major injury or illness*
- *Incidence of any condition requiring hospital care or chronic medication*
- *Use of disability leave*

*If the injury or illness is pressure related, clearance must come from a physician trained in diving medicine.

6 Nitrox Diving Guidelines

6.1 Authorization and Training

6.1.1 Authorization

Prior using Nitrox as a diver breathing gas, the following minimum requirements must be met:

- Only a certified Scientific Diver or DIT diving under the auspices of UMaine or another AAUS OM is eligible for authorization or training in the use of Nitrox..
- Request for authorization to use Nitrox must be made to the DSO/DCB.
- Request for authorization and/or completion of training does not automatically result in authorization to use Nitrox. The applicant must convince the DSO/DCB that they are sufficiently knowledgeable, skilled and proficient in the theory and use of Nitrox for diving.
- The signature of the DSO on the authorization form will acknowledge authorization, after which, divers will be eligible to use Nitrox within their depth authorization as specified in the Dive Plan.
- Nitrox authorization may be denied at any time to any diver who does not demonstrate to the satisfaction of the DSO/DCB the appropriate judgment or proficiency to ensure the safety of the diver and dive buddy.

6.1.2 Training

6.1.2.1 Baseline/Initial Training

In lieu of writing/promulgating AAUS-specific training standards for Nitrox divers, AAUS references the standards for Nitrox diver training as defined by the WRSTC and/or ISO. AAUS programs who wish to train Nitrox divers may do so using one of the following options:

1. Under the auspices and standards of an internationally recognized diver training agency.
2. Under the auspices of AAUS using the minimum guidelines presented by the most current version of the RSTC/WRSTC and/or ISO Nitrox diver training standards.

References:

"Minimum Course Content for Enriched Air Nitrox Certification" - World Recreational Scuba Training Council (WRSTC), www.wrstc.com.

"Recreational diving services- Requirements for training programs on enriches air nitrox (EAN) diving". ISO 11107:2009 - International Organization for Standardization (ISO), www.iso.org

6.1.2.2 Additional Training

Following industry standard training, the diver must complete additional practical and theoretical evaluation, to the satisfaction of the DSO/DCB.

- *Practical Evaluation*
  - Oxygen analysis of nitrox mixtures.
  - Determination of Maximum Operating Depth (MOD), oxygen partial pressure exposure (pO_2), and oxygen toxicity time limits, for various nitrox mixtures at various depths.
  - Determination of nitrogen-based dive limits status by Equivalent Air Depth (EAD) method using air dive tables, and/or using nitrox dive tables, as approved by the DCB.
  - Nitrox dive computer use may be included, as approved by the DCB.

- A minimum of 2 supervised open water checkout dives, to appropriate depths, demonstrating the application of theoretical and practical skills learned.

- *Theoretical Evaluation*
  - Function, care, use, and maintenance of equipment cleaned for Nitrox use.
  - Physical and physiological considerations of nitrox diving (e.g. O_2 and CO_2 toxicity)
  - Diving regulations, procedures/operations, and dive planning as related to Nitrox diving
  - Equipment marking and maintenance requirements
  - Dive table and/or dive computer usage
  - Calculation of: MOD, pO_2, and other aspects of Nitrox diving as required by the DCB

6.2 Minimum Activity to Maintain Authorization

Divers should log at minimum of 1 Nitrox dive per year. Failure to meet the minimum activity level may be cause for restriction or revocation of Nitrox authorization.

6.3 Operational Requirements

6.3.1 Oxygen Exposure Limits

- The inspired oxygen partial pressure experienced at depth should not exceed 1.6 ATA.
- The maximum allowable exposure limit should be reduced in cases where cold or strenuous dive conditions, or extended exposure times are expected.

6.3.2 Calculation/Monitoring of Decompression Status

- A set of DCB approved Nitrox dive tables should be available at the dive site.
- Dive computers may be used to compute decompression status during Nitrox dives. Manufacturer guidelines and operation instructions should be followed.
- Dive computers capable of pO_2 limit and fO_2 adjustment must be checked by the diver prior to each dive to ensure conformity with the Nitrox-mix being used.

6.3.3 Gas Mixture Requirements

Only Nitrox mixtures and mixing methods approved by the DSO/DCB in the Dive Plan may be used.

6.3.4 Analysis Verification by User

Prior to the dive, it is the responsibility of each diver to analyze/verify:

- *Oxygen content/percentage (fO_2) of the cylinder*
- *Maximum Operating Depth (MOD) of the mixture and pO_2 at the planned depth*

This information should be recorded in the Dive Log.

6.3.5 Lead Diver Authorization

On any UMaine dive during which Nitrox will be used by any team member, the Lead Diver should also be authorized to use Nitrox. As described in the Dive Plan, the Lead Diver should verify that all divers using Nitrox are properly authorized and qualified.

6.4 Nitrox Diving Equipment

Required Equipment

All designated equipment and stated requirements regarding scuba equipment required in Section 3.0 apply to Nitrox operations. Additional minimal equipment necessary for Nitrox diving operations includes:

- Labeled SCUBA Cylinders in Accordance with Industry Standards
- Oxygen Analyzers
- Oxygen compatible equipment- as applicable.

Gas Blending/Mixing

- All personnel blending/mixing Nitrox must be qualified and approved by the DCB for the method(s) used.
- Any equipment exposed to concentrations greater than 40% oxygen, should be cleaned and maintained for 'oxygen service'.
- Oxygen used for mixing Nitrox should meet "Medical Grade" (U.S.P.) or "Aviator Grade" standards
- Air that may come in contact with oxygen concentrations greater than 40% must have a hydrocarbon contaminant no greater than .01 mg/m^3, and meet the AAUS Air Purity Guidelines outlined in Section 3.6
- Compressor/filtration systems used for nitrox systems must produce hydrocarbon/oil free air.
- Oil-lubricated compressors placed in service for a nitrox system should be checked for oil and hydrocarbon contamination at least quarterly.
    - For remote site operations using compressors not controlled by UMaine where this is not verifiable, the DCB must develop a protocol to mitigate risk to the diver.
- Oxygen systems over 125 psig must have slow-opening shut-off valves.

Nitrox is not blended/mixed at UMaine facilities.
All Nitrox must be obtained from commercially available sources (i.e. dive shops).

7 Surface Supplied Diving Technologies

Surface supplied diving technologies include any diving mode in which a diver at depth is supplied with breathing gas from the surface.

7.1 Prerequisites

All surface supplied and hookah divers must be certified Scientific Divers or Divers in Training who have completed system specific training as authorized by the OM.

7.2 Surface Supplied Diving (Umbilical)

No Surface Supplied Diving using umbilical-configuration currently conducted at UMaine. Any planned surface supplied diving must comply with the most current AAUS Standard, and those of the host/sponsor of the diving operation, with the approval of the UMaine DSO/DCB.

7.3 Hookah

7.3.1 Hookah Definition

Hookah is an open circuit diving mode comprised of a remote gas supply, a long hose, and a standard scuba second stage or full-face mask. Hookah is generally used in shallow water (30 fsw or less), though the configuration has been used to supply breathing gas from a diving bell, habitat, or submersible/submarine.

7.3.2 Equipment Requirements

- The air supply hose must be rated for a minimum operating pressure of 130psi.
- Air supplied to the hookah diver must meet the air quality standards in section 3.60. *As such, air quality testing is required for any/all Hookah compressors. Testing must meet or exceed the requirements in Section 3.6.*
- Hookah supply systems must be capable of supplying all divers breathing from the system with sufficient gas for comfortable breathing for the planned depth and workload.
- Hookah system second stage should be capable of being attached to the diver in a way to avoid pulling stress on the second stage mouthpiece and affords easy release if the diver must jettison the regulator and hose.
- An independent reserve breathing gas supplied *must be carried* by each hookah diver:
    - When the diver does not have direct access to the surface
    - *If risk of entanglement or entrapment exists*
    - *As determined by the DSO/DCB during review of the Dive Plan.*

7.3.3 Operational Requirements

- Hookah diving must not be conducted beyond a depth distance from alternate breathing gas source as determined by the DCB. *20 ft at UMaine.*
- A diver's independent reserve breathing gas supply, if worn, must contain sufficient volume to allow the diver(s) to exit to the surface or alternate breathing gas source.
- Hookah divers not supported by diving bell, or underwater habitat must not be exposed to dives that require staged decompression.
- The OM DCB is responsible for developing additional operational protocols.

7.3.4 Hookah Diving in Aquariums

- In an aquarium *or other manmade structure of a known maximum depth,* a depth gauge is not required; the maximum obtainable depth of the aquarium may be used as the maximum diving depth.

- A hookah configured diver may operate without an in-water buddy in an aquarium provided the diver is tended from the surface; has visual, line pull, or voice communication with the tender; the diver carries an independent reserve breathing gas source containing sufficient volume to allow the diver to exit to the surface or alternate breathing gas source; and under other operational conditions as determined by the OM DCB.
- The OM DCB is responsible for developing additional operational protocols for hookah diving specific to the aquarium environment.

8 Staged Decompression Diving

Staged decompression diving performed under UMaine auspices must comply with all diving guidelines of this manual, and those of the host/sponsor of the diving operation, with the approval of the UMaine DSO/DCB during review of the Dive Plan.

Staged decompression diving shall be defined as any diving during which the diver cannot perform a direct return to the surface without performing a mandatory decompression stop to allow the release of inert gas from the diver's body. The following procedures must be observed when conducting dives requiring planned decompression stops.

8.1 Minimum Experience and Training Requirements

8.1.1 Prerequisites

1. Scientific Diver qualification according to Section 4.00.
2. Minimum of 100 logged dives, with experience in the depth range where decompression diving will be conducted.
3. Demonstration of the ability to safely plan and conduct dives deeper than 100 feet.
4. Nitrox certification/authorization according to AAUS Section 6.00 recommended.

8.1.2 Training

Training must be appropriate for the conditions in which dive operations are to be conducted. Minimum training must include the following:

1. A minimum of 6 hours of classroom training to ensure theoretical knowledge to include: physics and physiology of decompression; decompression planning and procedures; gas management; equipment configurations; decompression method, emergency procedures, and omitted decompression.
2. It is recommended that at least one training session be conducted in a pool or sheltered water setting, to cover equipment handling and familiarization, swimming and buoyancy control, to estimate gas consumption rates, and to practice emergency procedures.
3. No training dives requiring decompression shall be conducted until the diver has demonstrated acceptable skills under simulated conditions.
4. At least 6 open-water training dives simulating/requiring decompression shall be conducted, emphasizing planning and execution of required decompression, and including practice of emergency procedures.
5. Progression to greater depths shall be by 4-dive increments at depth intervals as specified in Section 5.50.
6. The following are the minimum skills the diver must demonstrate proficiently during dives simulating and requiring decompression:

- Buoyancy control
- Proper ascent rate
- Proper depth control
- Equipment manipulation
- Stage/decompression bottle use as pertinent to planned diving operation
- Buddy skills
- Gas management

- Time management
- Task loading
- Emergency skills

7. Divers shall demonstrate to the satisfaction of the DSO or qualified designee proficiency in planning and executing required decompression dives appropriate to the conditions in which diving operations are to be conducted
8. *Upon completion of training, the diver will be authorized to conduct required decompression dives as approved by the DSO/DCB during review of the Dive Plan.*

8.2 Minimum Equipment Requirements

1. Valve and regulator systems for primary (bottom) gas supplies must be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the regulator/valve system.
2. Cylinders with volume and configuration adequate for planned diving operations.
3. One of the second stages on the primary gas supply shall be configured with a hose of adequate length to facilitate effective emergency gas sharing in the intended environment.
4. Minimum dive equipment shall include:
    a. Diver location devices adequate for the planned diving operations and environment.
    b. Compass *Redundancy in the following equipment components is required at UMaine:*
    c. Decompression Schedules
    d. Dive Timing Devices
    e. Depth gauges
    f. Buoyancy Control Devices
    g. Cutting devices
    h. Lift bags and line reels

8.3 Minimum Operational Requirements

1. The maximum pO2 to be used for planning open-circuit required decompression dives is 1.6. It is recommended that a pO2 of less than 1.6 be used during bottom exposure.
2. Decompression dives may be planned using dive tables, dive computers, and/or PC software as approved by the DSO/DCB.
3. Breathing gases used while performing in-water decompression must contain the same or greater oxygen content as that used during the bottom phase of the dive.
4. The dive team must review emergency decompression procedures appropriate for and prior to each planned dive.
5. If breathing gas mixtures other than air are used for required decompression, their use must be in accordance with those regulations set forth in the appropriate sections of this manual.
6. Use of additional nitrox and/or high-oxygen fraction decompression mixtures as travel and decompression gases to decrease decompression obligations is recommended.
7. Use of alternate inert gas mixtures to limit narcosis is recommended for depths greater than 150 feet.
8. The maximum depth for required decompression using air as the bottom gas is 190 feet.
9. If a period of more than 6 months has elapsed since the last decompression dive, a series of progressive workup dives, defined by the DSO/DCB, to return the diver(s) to proficiency status prior to the start of project diving operations are required.
10. Mission specific workup dives are recommended.

9 Mixed Gas Diving

Mixed gas diving must comply with all diving guidelines of this manual, and those of the host/sponsor of the diving operation, with the approval of the UMaine DSO/DCB during review of the Dive Plan.

Mixed gas diving is defined as diving performed while breathing gas mixes containing proportions greater than 1% by volume of an inert gas other than nitrogen.

9.1 Minimum Experience and Training Requirements

9.1.1 Prerequisites

1. Nitrox training and authorization (Section 6).
2. If the intended use entails required decompression stops, divers will be previously certified and authorized in decompression diving (Section 8).
3. Divers must demonstrate to the DSO/DCB the appropriate skill set, knowledge, and attitude for training in the safe use of mixed gases.

9.1.2 Classroom Training

1. Review of topics and issues previously outlined in nitrox and required decompression diving training as pertinent to the planned operations.
2. The use of helium or other inert gases, and the use of multiple decompression gases.
3. Equipment configurations
4. Mixed gas decompression planning
5. Gas management planning
6. Thermal considerations
7. END determination
8. Mission planning and logistics
9. Emergency procedures
10. Mixed gas production methods
11. Methods of gas handling and cylinder filling
12. Oxygen exposure management
13. Gas analysis
14. Mixed gas physics and physiology

9.1.3 Confined Water Training

Confined water session(s) in which divers demonstrate proficiency in required skills and techniques for proposed diving operations.

9.1.4 Open Water Training

1. A minimum of 6 open water training dives.
2. At least one initial dive must be in 130 feet or less to practice equipment handling and emergency procedures.
3. Subsequent dives will gradually increase in depth, with a majority of the training dives being conducted between 130 feet and the planned operational depth.
4. Planned operational depth for initial training dives must not exceed 260 feet.
5. Diving operations beyond 260 feet requires additional training dives.

9.2 Equipment and Gas Quality Requirements

Equipment requirements must be developed and approved by the DSO/DCB. Equipment must meet other pertinent requirements set forth elsewhere in this standard. The quality of inert gases used to produce breathing mixtures must be of an acceptable grade for human consumption.

9.3 Minimum Operational Requirements

1. All applicable operational requirements for Nitrox and decompression diving must be met.
2. The maximum pO2 to be used for planning open-circuit decompression dives is 1.6. It is recommended that a pO2 of less than 1.6 be used during bottom exposure.
3. Divers decompressing on high-oxygen concentration mixtures must closely monitor one another for signs of acute oxygen toxicity.
4. If a period of more than 6 months has elapsed since the last mixed gas dive, a series of progressive workup dives, defined by the DSO/DCB, to return the diver(s) to proficiency status prior to the start of project diving operations are required
5. Mission specific workup dives are recommended.

10 Specialized Diving Environments

Certain types of diving, some of which are listed below, require additional equipment, procedures and training that exceed those described in this manual. Supplementary guidelines for these technologies are in development by the AAUS. Any planned diving in these specialized environments must comply with all diving guidelines of this manual, and those of the host/sponsor of the diving operation, with the approval of the UMaine DSO/DCB during review of the Dive Plan.

10.1 Blue Water Diving

Blue water diving is defined as diving in open water where the bottom is generally >200 feet deep. It requires special training and the use of multiple-tethered diving techniques. Specific guidelines that should be followed are outlined in "Blue Water Diving Guidelines" (California Sea Grant Publ. No. T-CSGCP-014).

10.2 Ice and Polar Diving

Divers planning to dive under ice or in polar conditions should use the following: "PESH-POL_2000.8 Standards for the Conduct of Scientific Diving", National Science Foundation, Division of Polar Programs, 2015.

10.3 Overhead Environments

Overhead environments include water filled Caverns, Caves, Flooded Mines and Ice diving, as well as portions of Sunken Shipwrecks and other manmade structures. For Cavern, Cave, or Flooded Mine Diving; see Section 12

For the purposes of this manual, Ice diving is a specialized overhead environment addressed in Section 10.2 and supplemented by requirements and protocols established by the OM DCB.

It is the responsibility of the OM DCB to establish the requirements and protocols under which diving will be safely conducted in overhead environment portions of sunken shipwrecks and other manmade structures.

10.4 Saturation Diving

UMaine does not conduct or supervise saturation diving operations. Any planned saturation diving operations must comply with the saturation diving guidelines of the OM sponsoring the saturation diving operation with the approval of the UMaine DSO/DCB.

10.5 Aquarium Diving

An aquarium is defined by AAUS as an artificial, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research.

It is recognized that within scientific aquarium diving there are environments and equipment that fall outside the scope of those addressed in this manual. In those circumstances it is the responsibility of the OM DCB to establish the requirements and protocol under which diving will be safely conducted.

At UMaine- while not an 'aquarium' by strict definition, the UMaine AECC W2 Wind/Wave tank will be treated as an aquarium for the purposes of this diving standard.

11 Rebreathers

**** NO REBREATHER DIVING CURRENTLY CONDUCTED AT UMAINE ****

INCORPORATION OF AAUS STANDARD and
DCB REVIEW REQUIRED
PRIOR TO ENGAGING IN THESE ACTIVITIES

12 Scientific Cave and Cavern Diving

**** NO CAVE/ CAVERN DIVING CURRENTLY CONDUCTED AT UMAINE ****

INCORPORATION OF AAUS STANDARD and
DCB REVIEW REQUIRED
PRIOR TO ENGAGING IN THESE ACTIVITIES

Appendices

Appendices 1 through 9
Required For All Organizational Members

Diving Medical Exam Overview for the Examining Physician

TO THE EXAMINING PHYSICIAN

This person requires a medical examination to assess fitness for participation in Scientific Diving activities at the University of Maine. Your evaluation is requested on the attached *Medical Evaluation of Fitness for Scuba Diving Report* (Appendix 2). The medical exam should be conducted in conjunction with a review of the applicant's *Diving Medical History Form* (Appendix 3).

If you have questions about diving medicine, you may wish to consult one of the *Recommended Physicians with Expertise in Diving Medicine* or *Selected References in Diving Medicine* (Appendix 4). Please contact the UMaine Diving Safety Officer if you have any questions or concerns about diving medicine or the University of Maine standards. Thank you for your assistance.

Christopher M. Rigaud, University of Maine Diving Safety Officer
Safety Management/ Scientific Diving Program
Darling Marine Center
193 Clarks Cove Road
Walpole, ME 04573
207-563-8273

CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING

(Adapted from Bove, 1998)

Scuba and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize air pressure changes. The most common cause of distress is eustachian insufficiency. Recent deaths in the scientific diving community have been attributed to cardiovascular disease. *The diver should be free of any chronic disabling disease and any conditions listed below for which restrictions from diving are generally recommended:*

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears.
2. Vertigo including Meniere's Disease.
3. Stapedectomy or middle ear reconstructive surgery.
4. Recent ocular surgery.
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression.
6. Substance abuse, including alcohol.
7. Episodic loss of consciousness.
8. History of seizure.
9. History of stroke or a fixed neurological deficit.
10. Recurring neurological disorders, including transient ischemic attacks.
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.
12. History of neurological decompression illness with residual deficit.
13. Head injury with sequelae.
14. Hematologic disorders including coagulopathies.
15. Evidence of coronary artery disease or high risk for coronary artery disease.
16. Atrial septal defects.
17. Significant valvular heart disease - isolated mitral valve prolapse is not disqualifying.
18. Significant cardiac rhythm or conduction abnormalities.
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD).
20. Inadequate exercise tolerance.
21. Severe hypertension.
22. History of spontaneous or traumatic pneumothorax.
23. Asthma.
24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.
25. Diabetes mellitus.
26. Pregnancy.

Medical Evaluation of Fitness for Scuba Diving Report

Name of Applicant:		
Date of Birth:	Date of Initial Exam:	Date of Current Exam:

To The Physician: Scientific divers require periodic medical examinations to assess their fitness to engage in diving with self-contained underwater breathing apparatus (scuba). The answers on the Diving Medical History Form may indicate potential health or safety risks as noted. Scuba diving is an activity that puts unusual stress on the individual in several ways. Your evaluation and opinion on the applicant's medical fitness is requested is requested on this Medical Evaluation Report. Scuba diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease. An absolute requirement is the ability of the lungs, middle ears, and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant. If you have questions about diving medicine, please consult with the Undersea Hyperbaric Medical Society or Divers Alert Network.

THE FOLLOWING TESTS ARE REQUIRED:

DURING ALL INITIAL AND PERIODIC RE-EXAMS (UNDER AGE 40):

- Medical history
- Complete physical exam, with emphasis on neurological and otological components
- Urinalysis
- Any further tests deemed necessary by the physician

ADDITIONAL TESTS DURING INITIAL AND PERIODIC RE-EXAMS (OVER AGE 40):

- Chest x-ray (Required only during first exam over age 40)
- Resting EKG
- Assessment of coronary artery disease using Multiple-Risk-Factor Assessment
- (age, lipid profile, blood pressure, diabetic screening, smoking)
- Note: Exercise stress testing may be indicated based on Multiple-Risk-Factor Assessment

PHYSICIAN'S STATEMENT:

I have evaluated this individual according to the UMaine Diving Medical Exam Overview for the Examining Physician, the provided Medical History report, and the required tests listed above. I have discussed with the patient any medical condition(s) that would not disqualify him/her from diving but which may seriously compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these conditions.	
_____ Diver **IS** medically qualified to dive for: *(Initials)* ❒ 2 years (over age 60) ❒ 3 years (age 40-59) ❒ 5 years (under age 40)	_____ Diver **IS NOT** medically qualified to dive: *(Initials)* ❒ Permanently ❒ Temporarily

Physician Signature: _____, **M.D./ D.O.** Date:_____

Physician Name (Print): _____

NOTE: Although portions of this exam may be conducted by other medical professionals, final approval for diving must come from a Medical Doctor (M.D.) or Osteopath (D.O.). Signatures by Physicians Assistants (P.A.) Nurse Practitioners (N.P.), etc. will not be accepted.

PHYSICIANS INFORMATION

Name: _____

Address: _____

Phone: _____ Email/Web: _____

1) My familiarity with applicant is (check one):

- ❒ Regular Physician for _____ years
- ❒ Other (describe)_____

2) My familiarity with diving medicine is:

- ❒ With this exam only
- ❒ Other:_____

NOTE: Initial approval does not guarantee admission to the program. UMaine reserves the right to request additional screening by physicians qualified in diving and hyperbaric medicine or other associated specialties.

PHYSICIANS REMARKS

_____

_____

_____

_____

_____

_____

_____

_____

Physician Signature: _____, **M.D./ D.O.** Date:_____

Diving Medical History Form

(To Be Completed By Applicant-Diver)

Name _____ Sex ____ Wt. _____ Ht. _____ DOB: _____

TO THE APPLICANT:

Scuba diving places considerable physical and mental demands on the diver. Certain medical and physical requirements must be met before beginning a diving or training program. In many instances, your medical history is more important in determining your fitness to dive than the physical exam. Obviously you should provide accurate information or the medical screening process will be compromised.

This form will be kept confidential. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you shall subsequently discuss that matter with your own physician who must then indicate, in writing, that you have done so and that no health hazard exists.

If your answers indicate a condition which might make diving hazardous, you will be asked to review the matter with your physician. In such instances, their written authorization will be required in order for further consideration to be given to your application. If your physician concludes that diving would involve undue risk for you, remember that they are concerned only with your well-being and safety. Please respect the advice and intent of this medical history form.

Please indicate if any of the following conditions currently or have ever applied to you			
Yes	**No**	**Cardiovascular**	**Comments**
		Bleeding disorders	
		Heart murmur	
		Large heart	
		High blood pressure	
		Angina (heart pains or pressure in the chest)	
		Heart attack	
		Low blood pressure	
		Recurrent or persistent swelling of the legs	
		Pounding, rapid heartbeat or palpitations	
		Easily fatigued or short of breath	
		Abnormal EKG	
		Varicose veins	
Yes	**No**	**Ears/Sinuses/Respiratory**	**Comments**
		Motion sickness or sea/air sickness	
		Perforated ear drums	
		Hay fever	
		Frequent sinus trouble drainage from the nose, post-nasal drip, or stuffy nose	
		Frequent earaches	
		Drainage from the ears	
		Difficulty with your ears in airplanes or on mountains	
		Ear surgery	

		Ringing in your ears	
		Frequent dizzy spells	
		Hearing problems	
		Trouble equalizing pressure in your ears	
		Asthma	
		Wheezing attacks	
		Cough (chronic or recurrent)	
		Frequently raise sputum	
		Pleurisy	
		Collapsed lung (pneumothorax)	
		Lung cysts	
		Pneumonia	
		Tuberculosis	
		Shortness of breath	
		Lung problem or abnormality	
		Spit blood	
		Breathing difficulty after eating particular foods, after exposure to particular pollens or animals	
		Subject to bronchitis	
Yes	**No**	**Musculoskeletal**	**Comments**
		Joint problems, dislocations or arthritis	
		Back trouble or back injuries	
		Ruptured or slipped disk	
		Limiting physical handicaps	
		Muscle cramps	
		Amputations	
Yes	**No**	**Neurological/ Behavioral/ Psychological**	**Comments**
		Convulsions, seizures, or epilepsy	
		Fainting spells or dizziness	
		Head injury causing unconsciousness	
		Paralysis	
		Headaches (frequent and severe)	
		Claustrophobia	
		Mental disorder or nervous breakdown	
		Anxiety spells or hyperventilation	
		Nervous tension or emotional problems	
		Take tranquilizers	

		Drug addiction	
		Alcoholism	
Yes	**No**	**Reproductive**	**Comments**
		Currently pregnant	
		Menstrual problems	
Yes	**No**	**Other**	**Comments**
		Diabetes	
		Major surgery	
		Presently being treated by a physician	
		Taking any medication regularly (even non-prescription)	
		Been rejected or restricted from sports	
		Wear dental plates	
		Wear glasses or contact lenses	
		Rheumatic fever	
		Scarlet fever	
		Have you ever had an adverse reaction to medication?	
		Do you smoke?	
		Have you ever had any other medical problems not listed? If so, please list or describe below.	
Yes	**No**	**Family/ Medical History**	**Comments**
		Is there a family history of high cholesterol?	
		Is there a family history of heart disease or stroke?	
		Is there a family history of diabetes?	
		Is there a family history of asthma?	
		Date of last tetanus shot and other vaccination records.	
Yes	**No**	**Diving History**	**Comments**
		Any problem related to diving	
		Subcutaneous emphysema (air under the skin)	
		Air embolism after diving	
		Decompression sickness	
Please explain any "yes" answers to the above questions.			

I certify that the above answers and information represent an accurate and complete description of my medical history.

Signature: _____ Date: _____

Recommended Physicians with Expertise in Diving Medicine

1. **Diver's Alert Network**
   The Peter B. Bennett Center
   6 West Colony Place
   Durham, NC 27705 USA
   Non-Emergency Medical Questions:
   1-800-446-2671 or 1-919-684-2948
   http://www.diversalertnetwork.org

2. **Undersea Hyperbaric and Medical Society**
   21 West Colony Place, Suite 280
   Durham, NC 27705
   Phone: 919-490-5140/877-533-8467
   http://membership.uhms.org/

3. **Howard Jones, M.D.**
   UMaine Occupational Physician
   Eastern Maine Medical Center/ UMaine Cutler Health Center
   207-581-4018

4. **Michael Clark, M.D.**
   80 River Road
   Newcastle, ME 04553
   207-563-3366

5. **Peter Goth, M.D.**
   P.O. Box 203
   Medomak Road
   Bremen, Maine 04551
   207-529-5747

Selected References in Diving Medicine

Most are available from Best Publishing Company, P.O. Box 30100, Flagstaff, AZ 86003-0100, the Divers Alert Network (DAN) or the Undersea and Hyperbaric Medical Association (UHMS), Bethesda, MD.

- Bove, A.A. 2011. The cardiovascular system and diving risk. Undersea and Hyperbaric Medicine 38(4): 261-269.
- Bove, A.A. and Davis, J. 2003. DIVING MEDICINE, Fourth Edition. Philadelphia: W.B. Saunders Company.
- Bove, A.A. ed. 1998. Medical Examination of Scuba Divers, San Antonio, TX: Medical Seminars, Inc.
- Douglas, P.S. 2011. Cardiovascular screening in asymptomatic adults: Lessons for the diving world. Undersea and Hyperbaric Medicine 38(4): 279-287.
- Edmonds, C., Lowry, C., Pennefather, J. and Walker, R. 2002. Diving and Subaquatic Medicine, Fourth Edition. London: Hodder Arnold Publishers.
- Elliott, D.H. ed. 1996. Are Asthmatics Fit to Dive? Kensington, MD: Undersea and Hyperbaric Medical Society.
- Grundy, S.M., Pasternak, R., Greenland, P., Smith, S., and Fuster, V. 1999. Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations. AHA/ACC Scientific Statement. Journal of the American College of Cardiology, 34: 1348-1359. http://content.onlinejacc.org/cgi/content/short/34/4/1348
- Mitchell, S.J., and A.A. Bove. 2011. Medical screening of recreational divers for cardiovascular disease: Consensus discussion at the Divers Alert Network Fatality Workshop. Undersea and Hyperbaric Medicine 38(4): 289-296.
- NOAA DIVING MANUAL, NOAA. Superintendent of Documents. Washington, DC: U.S. Government Printing Office.
- Thompson, P.D. 2011. The cardiovascular risks of diving. Undersea and Hyperbaric Medicine 38(4): 271-277.
- U.S. NAVY DIVING MANUAL. Superintendent of Documents, Washington, DC: U.S. Government Printing Office, Washington, D.C.

Definition of Terms

Air sharing - sharing of an air supply between divers.

ATA(s) - "Atmospheres Absolute", Total pressure exerted on an object, by a gas or mixture of gases, at a specific depth or elevation, including normal atmospheric pressure.

Alternate Gas Supply - fully redundant system capable of providing a gas source to the diver should their primary gas supply fail.

Authorization-the OM DCB authorizes divers to dive to specified depth, and use specialized modes of diving.

Breath-hold Diving - diving mode in which the diver uses no self-contained or surface-supplied breathing gas.

Bubble Check - visual examination by the dive team of their diving systems, looking for O-ring leaks or other air leaks conducted in the water prior to entering a cave. Usually included in the "S" Drill.

Buddy Breathing - sharing of a single air source between divers.

Buddy System -two comparably equipped scuba divers in the water in constant communication.

Buoyant Ascent - an ascent made using some form of positive buoyancy.

Cave Dive - a dive which takes place partially or wholly underground, in which one or more of the environmental parameters defining a cavern dive are exceeded.

Cavern Dive - a dive which takes place partially or wholly underground, in which natural sunlight is continuously visible from the entrance.

Certified Diver - a diver who holds a recognized valid certification from an internationally recognized certifying agency or AAUS OM.

(Scientific Diver) Certification- a diver who holds a recognized valid certification from an AAUS OM

Controlled Ascent - any one of several kinds of ascents including normal, swimming, and air sharing ascents where the diver(s) maintain control so a pause or stop can be made during the ascent.

Cylinder - a pressure vessel for the storage of gases.

Decompression Sickness - a condition with a variety of symptoms, which may result from gas, and bubbles in the tissues of divers after pressure reduction.

Designated Person-In-Charge – Surface Supplied diving mode manning requirement. An individual designated by the OM DCB or designee with the experience or training necessary to direct, and oversee in the surface supplied diving operation being conducted.

Dive - a descent into the water, an underwater diving activity utilizing compressed gas, an ascent, and return to the surface.

Dive Computer - a microprocessor based device which computes a diver's theoretical decompression status, in real time, by using pressure (depth) and time as input to a decompression model, or set of decompression tables, programmed into the device.

Dive Location - a surface or vessel from which a diving operation is conducted.

Dive Site - physical location of a diver during a dive.

Dive Table - a profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Diver – a person who stays underwater for long periods by having compressed gas supplied from the surface or by carrying a supply of compressed gas.

Diver-In-Training - an individual gaining experience and training in additional diving activities under the supervision of a dive team member experienced in those activities.

Diving Mode - a type of diving required specific equipment, procedures, and techniques, for example, snorkel, scuba, surface-supplied air, or mixed gas.

Diving Control Board (DCB) - group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program (See Diving Control Board under Section 1.).

Diving Safety Officer (DSO) - individual responsible for the safe conduct of the scientific diving program of the membership organization (See Diving Safety Officer under Section 1)

DPIC – see Designated Person-In-Charge.

EAD - Equivalent Air Depth (see below).

Emergency Swimming Ascent - an ascent made under emergency conditions where the diver may exceed the normal ascent rate.

Enriched Air (EANx) - a name for a breathing mixture of air and oxygen when the percent of oxygen exceeds 21%. This term is considered synonymous with the term "nitrox" (Section 6).

Equivalent Air Depth (EAD) - depth at which air will have the same nitrogen partial pressure as the nitrox mixture being used. This number, expressed in units of feet seawater or saltwater, will always be less than the actual depth for any enriched air mixture.

Flooded Mine Diving - diving in the flooded portions of a man-made mine. Necessitates use of techniques detailed for cave diving.

fO_2 - fraction of oxygen in a gas mixture, expressed as either a decimal or percentage, by volume.

FSW - Feet of seawater.

Gas Management - gas planning rule which is used in cave diving environments in which the diver reserves a portion of their available breathing gas for anticipated emergencies (See Rule of Thirds, Sixths).

Gas Matching – the technique of calculating breathing gas reserves and turn pressures for divers using different volume cylinders. Divers outfitted with the same volume cylinders may employ the Rule of Thirds for gas management purposes. Divers outfitted with different volume cylinders will not observe the same gauge readings when their cylinders contain the same gas volume, therefore the Rule of Thirds will not guarantee adequate reserve if both divers must breathe from a single gas volume at a Rule of Thirds turn pressure. Gas Matching is based on individual consumption rates in volume consumed per minute. It allows divers to calculate turn pressures based on combined consumption rates and to convert the required reserve to a gauge based turn pressure specific to each diver's cylinder configuration.

Guideline - continuous line used as a navigational reference during a dive leading from the team position to a point where a direct vertical ascent may be made to the surface.

Hookah - while similar to Surface Supplied in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for the monitoring his/her own depth, time, and diving profile.

Hyperbaric Chamber - see recompression chamber.

Hyperbaric Conditions - pressure conditions in excess of normal atmospheric pressure at the dive location.

Independent Reserve Breathing Gas - a diver-carried independent supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by another diver.

Jump/Gap Reel - spool or reel used to connect one guide line to another thus ensuring a continuous line to the exit.

Life Support Equipment – underwater equipment necessary to sustain life.

Lead Diver - certified scientific diver with experience and training to conduct the diving operation.

Organizational Member (OM) - an organization which is a current member of the AAUS, and which has a program, which adheres to the standards of the AAUS as, set forth in the *AAUS Manual.*

Manifold with Isolator Valve - a manifold joining two diving cylinders, that allows the use of two completely independent regulators. If either regulator fails, it may be shut off, allowing the remaining regulator access to the gas in both of the diving cylinders.

Mixed Gas - breathing gas containing proportions of inert gas other than nitrogen greater than 1% by volume.

Mixed Gas Diving - a diving mode in which the diver is supplied in the water with a breathing gas other than air.

MOD - Maximum Operating Depth, usually determined as the depth at which the pO_2 for a given gas mixture reaches a predetermined maximum.

Nitrox - any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 22% and 40% oxygen. Also be referred to as Enriched Air Nitrox, abbreviated EAN.

Normal Ascent - an ascent made with an adequate air supply at a rate of 30 feet per minute or less.

OTU - Oxygen Toxicity Unit

Oxygen Compatible - a gas delivery system that has components (O-rings, valve seats, diaphragms, etc.) that are compatible with oxygen at a stated pressure and temperature.

Oxygen Service - a gas delivery system that is both oxygen clean and oxygen compatible.

Oxygen Toxicity - any adverse reaction of the central nervous system ("acute" or "CNS" oxygen toxicity) or lungs ("chronic", "whole-body", or "pulmonary" oxygen toxicity) brought on by exposure to an increased (above atmospheric levels) partial pressure of oxygen.

Penetration Distance - linear distance from the entrance intended or reached by a dive team during a dive at a dive site.

Pressure-Related Injury - an injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include: decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, or ruptured eardrum.

Pressure Vessel - see cylinder.

pO_2 - inspired partial pressure of oxygen, usually expressed in units of atmospheres absolute.

Primary Reel - initial guideline used by the dive team from open water to maximum penetration or a permanently installed guideline.

Psi - unit of pressure, "pounds per square inch.

Psig – unit of pressure, "pounds per square inch gauge.

Recompression Chamber - a pressure vessel for human occupancy. Also called a hyperbaric chamber or decompression chamber.

Restriction - any passage through which two divers cannot easily pass side by side while sharing air.

Rule of Thirds - gas planning rule which is used in cave diving environments in which the diver reserves 2/3's of their breathing gas supply for exiting the cave or cavern.

Rule of Sixths - air planning rule which is used in cave or other confined diving environments in which the diver reserves 5/6's of their breathing gas supply (for DPV use, siphon diving, etc.) for exiting the cave or cavern.

Safety Drill - ("S" Drill) - short gas sharing, equipment evaluation, dive plan, and communication exercise carried out prior to entering a cave or cavern dive by the dive team.

Safety Reel - secondary reel used as a backup to the primary reel, usually containing 150 feet of guideline that is used in an emergency.

Safety Stop- a pause or stop during a controlled ascent, generally between 15-20fsw for 3-5 minutes; unless otherwise required by a dive computer, dive table, or PC-based decompression planning software

Scientific Diving - Scientific diving is defined (29CFR1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

Scuba Diving - a diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Side Mount - a diving mode utilizing two independent SCUBA systems carried along the sides of the diver's body; either of which always has sufficient air to allow the diver to reach the surface unassisted.

Siphon - cave into which water flows with a generally continuous in-current.

Standby Diver - a diver at the dive location capable of rendering assistance to a diver in the water.

Surface Supplied Diving - dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to keep up with the divers' depth, time and diving profile.

Swimming Ascent - an ascent, which can be done under normal or emergency conditions accomplished by simply swimming to the surface.

Tender - used in Surface supplied and tethered diving. The tender comprises the topsides buddy for the in-water diver on the other end of the tether. The tender must have the experience or training to perform the assigned tasks in a safe and healthful manner.

Turn Pressure – the gauge reading of a diver's open circuit scuba system designating the gas limit for terminating the dive and beginning the exit from the water.

Umbilical - composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies a diver or bell with breathing gas, communications, power, or heat, as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

Reciprocity Request / Verification of Scientific Diver Status

This letter is to certify that _____ is currently a certified scientific diver at the University of Maine Darling Marine Center, qualified at the level of _____.

A. Training Information

Activity	Date
Written Scientific Diving Exam	
Diving Medical Exam	
Scuba equipment service/test	
Checkout Dive	

Coursework	Date	Agency
CPR		
First Aid		
Oxygen First Aid		

B. Diving Information

Date of last UMaine dive:	Depth Certification:
# Dives logged in last 12 months:	Restrictions?

C. Additional Certifications

- ❒ Dry suit
- ❒ Ice/Polar
- ❒ Altitude
- ❒ Computer
- ❒ Blue water
- ❒ Other: _____
- ❒ Nitrox
- ❒ Mixed Gas
- ❒ Decompression
- ❒ Saturation
- ❒ Surface Supplied
- ❒ Rescue
- ❒ Divemaster
- ❒ Instructor
- ❒ Night
- ❒ Cavern/Cave
- ❒ EMT
- ❒ Dive Accident Management
- ❒ Chamber Operator
- ❒ Closed Circuit
- ❒ Small Boat Operator

D. Verification

The information listed above is true and accurate according to the records of the University of Maine. The University of Maine is an Organizational Member of the American Academy of Underwater Sciences (AAUS) and conforms to the minimum requirements for scientific diver training and evaluation as set forth by the AAUS.

Signature Date

Signature Date

Christopher M. Rigaud
Diving Safety Officer
University of Maine Darling Marine Center
Phone: 207-563-3146 x232
Email: crigaud@maine.edu

Diving Emergency Management Procedures

A diving accident victim could be any person who has been breathing compressed gas underwater regardless of depth. Decompression sickness and arterial gas embolism, collectively referred to as decompression illness (DCI) can affect any diver on any dive and may present with a wide variety of signs and symptoms. In any case, it is essential that emergency procedures and medical treatment is initiated as soon as possible.

The general plan for a diving accident victim is to call 911 and arrange for transport to the nearest hospital or medical facility by ambulance. The receiving physician will provide appropriate care and, if necessary, arrange for transportation to a hyperbaric facility. Even seemingly mild signs and symptoms (i.e., numbness/tingling) can indicate a serious diving injury. When in doubt, always assume DCI and begin the emergency response procedures, below.

EMERGENCY RESPONSE PROCEDURES

Rescue/ Recover the Diver

↓

Call for Emergency Assistance/ Transport

(911 or USCG VHF Ch. 16)
State that this is a medical emergency.
State your location and the condition of the diver.
Request transport to the nearest hospital/ medical facility.
If on the water, head in the direction of your nearest port or dock and/or coordinate with USCG.

↓

Provide Basic Life Support

(CPR, First Aid)

↓

Provide 100% Oxygen

(Demand mask; Non-rebreather mask @15lpm; Resuscitation mask @15lpm)

↓

Conduct a Field Neurological Examination

(Assessment of injured diver's sensory and motor responses)

↓

Notify UMaine DSO

If the UMaine DSO is not available, call the Diver's Alert Network (DAN).
Ask for additional guidance and assistance with medical care, hyperbaric treatment, or transport.

+++ First Responders/ EMS/ Hospital Attendants +++

The individual seeking care has been diving using compressed gas. Although this person may appear healthy and uninjured, it is possible that serious neurological or other injuries are present. In any case, it is essential that medical evaluation and treatment is initiated as soon as possible. It is critically important that this individual be provided High-Flow Oxygen (100% O2, 15 liters/minute, Non-rebreather mask) until they are evaluated by a physician.

+++ Examining Physicians +++

Pressure related diving injuries can occur in any person who has been breathing compressed gas underwater regardless of depth. Decompression sickness and arterial gas embolism, collectively referred to as decompression illness (DCI) can affect any diver on any dive and may present with a wide variety of signs and symptoms. Evaluation of this injured diver should include a full physical and neurological examination. Consultation with a physician knowledgeable in diving medicine is encouraged.

Thank you for ensuring the best possible care for our diver!

UMaine Diving Safety Officer

DIVING EMERGENCY MANAGEMENT CONTACT INFORMATION

UMaine Diving Safety Officer (DSO)
Christopher Rigaud
Office: (207) 563-8273
Mobile: (207) 949-2289

Divers Alert Network (DAN)
Emergency Hotline: 1-919-684-9111
Medical Information: 1-919-684-2948
Based at Duke University Medical Center, DAN has diving medical specialists on-call 24 hours/day to answer questions and provide guidance on diving injuries and care. DAN can also help to arrange transport to the nearest hyperbaric facility if necessary.

Maine Hyperbaric Centers

Southern/ Central Maine
Dr. Lane Kaplan
St. Mary's Regional Medical Center
Hyperbaric and Wound Care Center
95 Campus Avenue
Lewiston, ME 04240
Direct Phone: 888-526-5511, or (207) 777-8331
Emergency Dept. Access: (207) 777-8120

Downeast Maine
Dr. Marian Benner/ Dr. Michael Coyne
St. Joseph's Hospital
Problem Wound & Hyperbaric Medicine Center
360 Broadway, Bangor, Maine
Direct Phone: 207-907-1550 or 207-907-1000
Emergency Room: 207-907-3000

UMaine Diving Control Board (DCB)
Emmanuel Boss, School of Marine Sciences
Office: (207) 581-4378
Mobile: (207) 356-9147

Robert Downs, Darling Marine Center
Office: (207) 563-8306
Mobile: (207) 592-0889

Warren Riess, Darling Marine Center
Office: (207) 563-8177
Home: (207) 677-2534

Robert Steneck, School of Marine Sciences
Office: (207) 563-8317
Home: (207) 549-3062

Richard Wahle, Darling Marine Center
Office: (207) 563-8297
Mobile: (207) 841-7723

Rhian Waller, Darling Marine Center
Office: (207) 563-8310
Mobile: (207) 350-0028

Mark Wells, School of Marine Sciences
Office: (207) 581-4322
Mobile: (209) 404-0044
Home: (207) 866-3047

Darling Marine Center (DMC)

DMC Main Office: (207) 563-3146
Linda Healy, 3-8220
Lisa Ouellette, 3-8202

Timothy Miller, Laboratory Manager
Office: (207) 563-8330
Mobile: (207) 557-3067

AAUS Statistics Collection Criteria and Definitions

COLLECTION CRITERIA

The "Dive Time in Minutes", The Number of Dives Logged", and the "Number of Divers Logging Dives" will be collected for the following categories:

- Dive Classification
- Breathing Gas
- Diving Mode
- Decompression Planning and Calculation Method
- Depth Ranges
- Specialized Environments
- Incident Types

STATISTICS DEFINITIONS

- Dive Time in Minutes- the surface to surface time including any safety or required decompression stops.

- Dive- a descent into water, an underwater diving activity utilizing compressed gas, an ascent/return to the surface, and a surface interval of greater than 10 minutes. Dives will not be differentiated as open water or confined water dives. But open water and confined water dives will be logged and submitted for AAUS statistics classified as either scientific or training/proficiency.

- Diver Logging a Dive- a person who is diving under the auspices of your scientific diving organization. Dives logged by divers from another AAUS Organization will be reported with the divers home organization. Only a diver who has actually logged a dive during the reporting period is counted under this category.

- Incident(s) occurring during the collection cycle- Only incidents occurring during, or resulting from, a dive where the diver is breathing a compressed gas will be submitted to AAUS.

Dive Classification

- Scientific Dives- Dives that meet the scientific diving exemption as defined in 29 CFR 1910.402. Diving tasks traditionally associated with a specific scientific discipline are considered a scientific dive. Construction and trouble-shooting tasks traditionally associated with commercial diving are not considered a scientific dive.
- Training and Proficiency Dives- Dives performed as part of a scientific diver training program, or dives performed in maintenance of a scientific diving certification/authorization.

Breathing Gas

- Air- Dives where the bottom gas used for the dive is air.
- Nitrox- Dives where the bottom gas used for the dive is a combination of nitrogen and oxygen other than air.
- Mixed Gas- Dives where the bottom gas used for the dive is a combination of oxygen, nitrogen, and helium (or other "exotic" gas), or any other breathing gas combination not classified as air or nitrox.

Diving Mode

- Open Circuit Scuba- Dives where the breathing gas is inhaled from a self contained underwater breathing apparatus and all of the exhaled gas leaves the breathing loop.
- Surface Supplied- Dives where the breathing gas is supplied from the surface by means of a pressurized umbilical hose. The umbilical generally consists of a gas supply hose, strength member, pneumofathometer

hose, and communication line. The umbilical supplies a helmet or full-face mask. The diver may rely on the tender at the surface to keep up with the divers' depth, time and diving profile.

- Hookah- While similar to Surface Supplied in that the breathing gas is supplied from the surface by means of a pressurized hose, the supply hose does not require a strength member, pneumofathometer hose, or communication line. Hookah equipment may be as simple as a long hose attached to a standard scuba cylinder supplying a standard scuba second stage. The diver is responsible for the monitoring his/her own depth, time, and diving profile.
- Rebreathers- Dives where the breathing gas is repeatedly recycled in the breathing loop. The breathing loop may be fully closed or semi-closed. Note: A rebreather dive ending in an open circuit bailout is still logged as a rebreather dive.

Decompression Planning and Calculation Method

- Dive Tables
- Dive Computer
- PC Based Decompression Software

Depth Ranges

- Depth ranges for sorting logged dives are: 0-30, 31-60, 61-100, 101-130, 131-150, 151-190, 191-250, 251-300, and 301->. Depths are in feet seawater (when measured in meters: 0-10, >10-30, >30-40, >40-45, >45-58, >58-76, >76-92, and >92->). A dive is logged to the maximum depth reached during the dive.
- Note: Only "The Number of Dives Logged" and "The Number of Divers Logging Dives" will be collected for this category.

Specialized Environments

- Required Decompression- Any dive where the diver exceeds the no-decompression limit of the decompression planning method being employed.
- Overhead Environments- Any dive where the diver does not have direct access to the surface due to a physical obstruction.
- Blue Water Diving- Open water diving where the bottom is generally greater than 200 feet deep and requiring the use of multiple-tethered diving techniques.
- Ice and Polar Diving- Any dive conducted under ice or in polar conditions. Note: An Ice Dive would also be classified as an Overhead Environment dive.
- Saturation Diving- Excursion dives conducted as part of a saturation mission are to be logged by "classification", "mode", "gas", etc. The "surface" for these excursions is defined as leaving and surfacing within the Habitat. Time spent within the Habitat or chamber shall not be logged by AAUS.
- Aquarium- An aquarium is a shallow, confined body of water, which is operated by or under the control of an institution and is used for the purposes of specimen exhibit, education, husbandry, or research. (Not a swimming pool)

Incident Types

- Hyperbaric- Decompression Sickness, AGE, or other barotrauma requiring recompression therapy.
- Barotrauma- Barotrauma requiring medical attention from a physician or medical facility, but not requiring recompression therapy.
- Injury- Any non-barotrauma injury occurring during a dive that requires medical attention from a physician or medical facility.
- Illness- Any illness requiring medical attention that can be attributed to diving.
- Near Drowning/ Hypoxia- An incident where a person asphyxiates to the minimum point of unconsciousness during a dive involving a compressed gas. But the person recovers.
- Hyperoxic/Oxygen Toxicity- An incident that can be attributed to the diver being exposed to too high a partial pressure of oxygen.
- Hypercapnea- An incident that can be attributed to the diver being exposed to an excess of carbon dioxide.

- Fatality- Any death accruing during a dive or resulting from the diving exposure.
- Other- An incident that does not fit one of the listed incident types.

Incident Classification Rating Scale

Minor- Injuries that the OM considers being minor in nature. Examples of this classification of incident would include, but not be limited to:

- Mask squeeze that produced discoloration of the eyes.
- Lacerations requiring medical attention but not involving moderate or severe bleeding.
- Other injuries that would not be expected to produce long term adverse effects on the diver's health or diving status.

Moderate- Injuries that the OM considers being moderate in nature. Examples of this classification would include, but not be limited to:

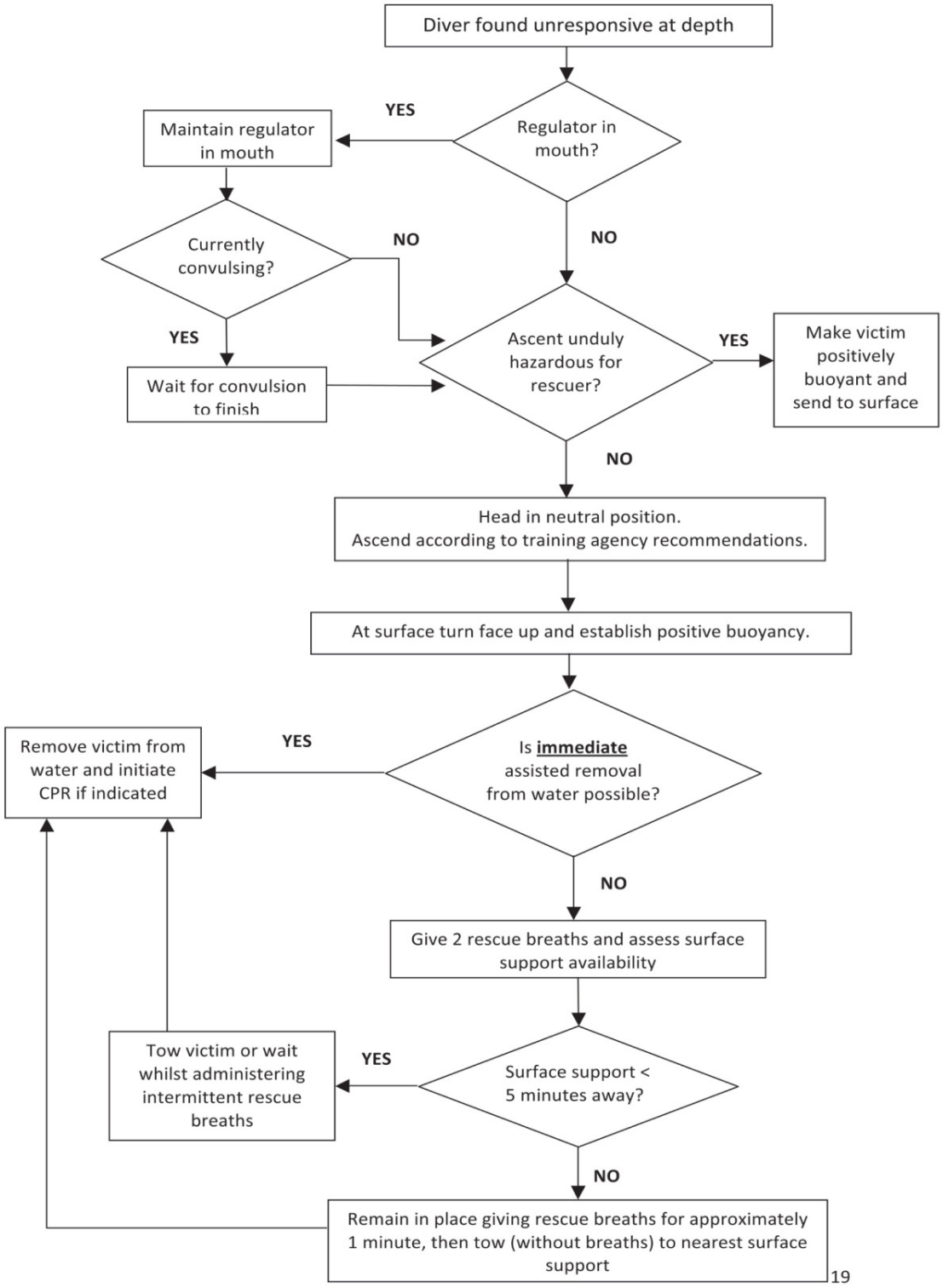
- DCS symptoms that resolved with the administration of oxygen, hyperbaric treatment given as a precaution.
- DCS symptoms resolved with the first hyperbaric treatment.
- Broken bones.
- Torn ligaments or cartilage.
- Concussion.
- Ear barotrauma requiring surgical repair.

Serious- Injuries that the OM considers being serious in nature. Examples of this classification would include, but not be limited to:

- Arterial Gas Embolism.
- DCS symptoms requiring multiple hyperbaric treatment.
- Near drowning.
- Oxygen Toxicity.
- Hypercapnea.
- Spinal injuries.
- Heart attack.
- Fatality.

Recommendations For Rescue Of A Submerged Unresponsive Compressed-Gas Diver

From: S.J. Mitchell et al., Undersea and Hyperbaric Medicine 2012, Vol. 39, No. 6, pages 1099-1108



19

Scientific Diver Information Sheet

Application Date: _____/_____/_____

Personal Information	
Applicant Name:	Date of Birth:
Mailing Address:	Home Phone:
	Daytime Phone:
	Cell Phone:
	Email:
Emergency Contact Information	
Contact Name:	Address:
Relationship:	
Phone:	
Alternate Phone:	
Special Instructions:	
Employment Information	
Employer Name::	Position/Title:
Supervisor Name:	Position/Title
Supervisor Address:	Supervisor Phone:
	Supervisor Email:
Scientific Diving Experience	
Have you previously been as qualified scientific diver? ❒ Yes ❒ No	If YES: Please complete information below and provide an official letter from the previous institution's DSO verifying scientific diver training and qualification, with copies of supporting documentation.
Institution/Organization Name:	
Diving Safety Officer Name:	Date of Last Scientific Dive:
Phone:	Address:
Email:	

General Diving Experience		
Dive Training (attach copies of all certifications)	**Agency**	**Date**
Certification Level:		
Number of Career Dives:		
Additional Certifications (i.e. drysuit, enriched air nitrox, dive rescue, etc.)	**Agency**	**Date**
1.		
2.		
3.		
4.		
Emergency Care Training	**Agency**	**Date**
CPR		
First Aid		
Oxygen Administration		
Other:		

Diving Experience Summary: Please provide a brief description of your diving experience. Include total number of dives, diving environments, equipment used, projects worked on, investigators with whom you have worked, etc. Use additional pages if necessary. Attach copies of any/all certifications.

Recent Diving Activity: To qualify as an active scientific diver you must have logged 12 dives in the last 12 months (1 dive in the last 6 months near your depth certification). This does not apply to divers engaged in training activities.

#	Date	Location	Depth	Time	Purpose	Institution / Organization
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Proposed Diving Activities

Briefly describe your proposed diving activities. Include depth ranges(s), site/locations, tasks and equipment, # dives per day, # divers, etc. (this is not a substitute for an authorized Dive Plan).

Equipment Information

(R = required equipment) (* = proof of annual service required)	Model/Type	Serial #	Service Date
Regulator (* R)			
Alternate Air Source (* R)			
Pressure Gauge (R)			
Depth Gauge (* R)			
Dive Timer/Computer (* R)			
BC/ BCD (R)			
Exposure Suit			
Weight System			
Mask, Snorkel & Fins			
Cutting Tool (R)		Audible Surface Signal (i.e. whistle) (R)	

Additional Equipment:

UMaine Dive Log

**** SEE DIVING SAFETY OFFICER FOR DIVE LOG TEMPLATE ****

Dive Checklist / SCUBA

This checklist has been developed for scientific divers/ dive teams to assist in meeting the requirements of the UMaine Scientific Diving Program. This checklist will not be applicable to all diving operations and is not a substitute for an authorized dive plan, or diver training. It is the responsibility of the Lead Diver and Principal Investigator to be familiar with UMaine diving procedures/policies and ensure compliance with UMaine standards.

1. **Dive Plan**
   - ☐ Dive Plan approved/signed by DSO?
   - ☐ Lead Diver identified?
   - ☐ All participating divers listed on Dive Plan?
   - ☐ All participating divers submitted, approved/signed UMaine Sci. Diving Application?
   - ☐ Diver depth authorizations within limits of the planned dive?
   - ☐ Divers in Training to be supervised by Scientific Divers?
   - ☐ Dive planned around least experienced diver?

2. **Pre-Dive**

Environmental
- ☐ Float Plan/ Shore Contact?
- ☐ Weather/seas forecast?
- ☐ Surface and underwater conditions evaluated?
- ☐ Conditions at dive site within experience level of dive team?
- ☐ Vessel traffic or other potential hazards?
- ☐ Dive Flag (check local regulations/requirements)?

Dive Team
- ☐ Divers physically/mentally prepared for diving?
- ☐ Decompression Status of divers?
  - o Previous dives logged/documented per UMaine policy?
  - o Residual nitrogen from repetitive dive(s)?
- ☐ Review dive plan/ tasks to be completed/ emergency procedures, etc?
- ☐ Inspect/test individual equipment?

Required Equipment (for each diver)
- ☐ Mask
- ☐ Fins
- ☐ Weight System
- ☐ Adequate Exposure Protection
- ☐ Whistle/ Audible Surface Signal
- ☐ Dive Knife/ Cutting Instrument
- ☐ Buoyancy Control Device w/ Low Pressure Inflator
- ☐ Regulator with Alternate Air Source
- ☐ Submersible Pressure Gauge
- ☐ Depth Gauge and Timing Device OR Dive Computer
- ☐ Air Cylinder
- ☐ Dive Tables and On-Site Dive Log/Record

**see also Pre-Dive Equipment Check on next page.*

Recommended Equipment
- ☐ Snorkel
- ☐ Compass
- ☐ Visual Surface Signal (safety sausage)
- ☐ Dive Slate and Pencil

Ancillary Equipment
- ☐ UW Lights
- ☐ Lift Bag
- ☐ Equipment specific to the task (data recorder/slate, quadrats, transect tape, camera, etc.)
- ☐ Any other equipment deemed necessary by the Lead Dive/ Principal Investigator.

Emergency Equipment/ Procedures
- ☐ First Aid and Emergency Oxygen on-site?
- ☐ Review Emergency Communications (phone, VHF)?
- ☐ Nearest accessible shore location for emergency responders/transport?
- ☐ Buddy separation procedure?

- ☐ Lost/ Missing diver procedure?
- ☐ Diver Injury/ Illness?

3. **Post Dive**

Environmental

- ☐ Were environmental conditions as expected?

Dive Team

- ☐ Any divers experiencing physical difficulties/ problems?
- ☐ Did the pre-dive plan work as planned?
- ☐ Was the task completed?
- ☐ What could be done different to improve the next dive?
- ☐ What did you learn or reaffirm from this dive?

Equipment

- ☐ Any equipment problems/malfunctions?
- ☐ Examine dive equipment for damage.
- ☐ Perform post dive maintenance.

Dive Logs

- ☐ Record Dive Profiles on-site (Time In/Out, Depth, Bottom Time, etc.).
- ☐ Complete UMaine Dive Log and Submit to DSO within 30 days of dive.

Pre-Dive Equipment Check Summary

Exposure Protection: Adequate for the dive, in good condition, working properly. Check seals/zippers. On drysuits, connect LP inflator, verify inflation/deflation mechanisms working properly.
Mask: Check face seal, frame, buckles, straps, and purge device.
Fins: Check straps, buckles, and blades.
Snorkel: Check mouthpiece, tube, attachment point, and purge device.
Weight System: Verify the proper amount of weight; quick release device(s) accessible and working.
Buoyancy Control Device/ Backpack (BCD): check for proper donning, tank secure, straps not twisted, connect LP inflator, verify inflation/deflation mechanisms working properly, bladder holds air.
Releases: Verify location and operation of all equipment releases on all divers.
Tank: Check tank is secure, valve fully open.
Regulator with octopus or alternate air: Check hoses for cracks, leaks. Inhale/exhale through both primary and alternate air source to verify proper operation. Ensure dive team understands how/where to access your alternate air source.
Pressure Gauge: Check hose, pivot, and gauge for leaks. Verify gas volume/pressure adequate for dive.
Depth Gauge and Timing Device: Check for zero reading on surface, reset tattletale if equipped. Note time or set timing device to zero.
Dive Computer: Verify operation, check for zero reading on surface, verify gas mix if necessary.
Dive Tables: Verify time/depth of No Decompression Limit, Residual from previous dives, etc.
Cutting Instrument: Check that the tool is sharp and secured in an accessible location.
Whistle/Audible Surface Signal: Check that device is functional and accessible for emergency use.
Underwater lights: Check seals, batteries, illumination.
Lift bags: Check for rips, holes, tears, anything that might fail under a load. Verify operation of dump mechanism and attachment/lifting harness.
Scientific Equipment: Check sampling and data collection equipment to be utilized.
Hand Signals: Review hand signals.

Dive Plan

This Dive Plan has been developed as a template for scientific divers/ dive teams to use in meeting the requirements of the UMaine Scientific Diving Program. This Dive Plan will not be applicable to all diving operations and is not valid until approved and signed by the Diving Safety Officer. It is the responsibility of the Lead Diver and Principal Investigator to be familiar with UMaine diving procedures/policies and ensure compliance with UMaine standards.

Principal Investigator: _____ **Lead Diver:** _____

Scientific Objective/Purpose of the Dive: _____

1. DIVER AUTHORIZATIONS (All divers must submit Individual Scientific Diver Applications)			
Diver Name	**Diver Level/ Depth Authorization**	**Affiliation**	**Email Address**

2. EMERGENCY CONTACT INFORMATION			
Diver Name	**Emergency Phone**	**Contact Person**	**Relationship**

3. DIVING INFORMATION

- Location of Dives/ Dive Sites?
- Approximate number of proposed dives? Number of Repetitive Dives?
- Estimated depths and bottom times anticipated?
- Breathing Gases Used?
- Method of Decompression Planning?
- Proposed work, equipment and boats to be employed?
- Any hazardous conditions anticipated: none anticipated?

4. EMERGENCY PLAN

- Emergency Equipment on site?
- Nearest emergency medical facility/phone?
- Nearest hyperbaric chamber location/phone?
- Method of contact/ transport?

5. DIVING SAFETY OFFICER COMMENTS/ RESTRICTIONS

6. APPROVAL & SIGNATURES

Principal Investigator
Name: _____ Dept. _____

Signature: _____ Date: ___/___/____

Lead Diver
Name: _____ Dept. _____

Signature: _____ Date: ___/___/____

Diving Safety Officer

X _____ Date: ___/___/_____
Christopher Rigaud, UMaine Diving Safety Officer

Dive Site Description

Port Information	
Port of Departure (POD):	Latitude:
Address:	Longitude:
	Phone:
	VHF Freq.:
Site Information	
Name:	Latitude:
Distance/Time to POD:	Longitude:
Nearest Shore:	
Water Type (*1)	Bottom Composition:
Anchorage (*2)	
*1- Offshore, river, cove, protected channel, etc. *2- Mooring or anchor (if anchor include style)	Depth:
Emergency Procedures	
Nearest Port:	Latitude:
Address:	Longitude:
	Phone:
	VHF Freq.:

Distance/Time:	Nearest USCG Station:
EMS Service:	Phone:

Additional Information

Scientific Diver Application

Candidate:		**Date of Issue:**
Supervisor:		**Date of Expiry:**
Temporary Diver/ Diver in Training (Requires supervision by an approved UMaine Scientific Diver)	**Date**	**Comments**
☐ Copy of Certification Card	_____	
☐ Medical History	_____	
☐ Medical Exam	_____	
☐ Diver Information Sheet	_____	
☐ Regulator Service	_____	
☐ UMaine Orientation and Quiz	_____	
☐ Liability/Insurance/Employment Forms	_____	
☐ Checkout Dive	_____	
Scientific Diver/Lead Diver	**Date**	
❒ Diver In Training requirements met	_____	
❒ CPR	_____	
❒ First Aid	_____	
❒ Oxygen Administration	_____	
❒ Scientific Diving Written Exam	_____	
❒ Rescue Diver	_____	
❒ DOT HP Cylinder Training	_____	
❒ 100hr. Scientific Diving Course	_____	
❒ 12 Dives (in last 12 months)	_____	
❒ Depth Certification: 30ft. 60ft 100ft 130ft. 130ft.		
❒ Certifications issued: AOW-_____ Rescue-_____ Sci.Dive-_____		

Completion of this application verifies that the aforementioned diver candidate has successfully met the documentation and training requirements as stated in the *University of Maine Standards for Scientific Diving Certification and Operation of Scientific Diving Programs*. As such, this individual may participate in sanctioned diving activities at the University of Maine at the level of: (check)

❒ Temporary Diver ❒ Diver in Training ❒ Scientific Diver

This application is valid for the period indicated (not to exceed 12 months) at which time the diver's credentials must be reviewed.

Candidate: X_____

Supervisor: X_____

Diving Safety Officer: X_____
Christopher Rigaud, UMaine Diving Safety Officer

The University of Maine Diving Control Board has developed this application to comply with the requirements for scientific diving established in the *University of Maine Standards for Scientific Diving Certification and Operation of Scientific Diving Programs* and in accordance with applicable national guidelines for scientific diving established by the American Academy of Underwater Sciences (AAUS). This application is valid only for the time period indicated and only for scientific diving operations conducted under the auspices of the University of Maine. It does not eliminate or reduce any requirements of diver training, conduct, or documentation and should not be used as the sole source of information regarding a diver's qualifications, training record, or current UMAINE diver status. Contact the UMAINE Diving Safety Officer for more complete information.

AAUS Dive Computer Guidelines

1. Only those makes and models of dive computers specifically approved by the Diving Control Board may be used.

2. Any diver desiring the approval to use a dive computer as a means of determining decompression status must apply to the Diving Control Board, complete an appropriate practical training session and pass a written examination.

3. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have his/her own unit.

4. On any given dive, both divers in the buddy pair must follow the most conservative dive computer.

5. If the dive computer fails at any time during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.

6. A diver should not dive for 18 hours before activating a dive computer to use it to control their diving.

7. Once the dive computer is in use, it must not be switched off until it indicates complete out gassing has occurred or 18 hours have elapsed, whichever comes first.

8. When using a dive computer, non-emergency ascents are to be at a rate specified for the make and model of dive computer being used.

9. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 minutes, especially for dives below 60 fsw.

10. Multiple deep dives require special consideration.

Regulator Service Form

The University of Maine Scientific Diving Program requires that scuba regulators and gauges be inspected and tested prior to first use and every twelve (12) months thereafter. Inspection and testing must be performed by a qualified scuba equipment technician. The following form represents a suggested list inspection/testing items. This form or similar documentation should be submitted to the DSO along with a receipt from the technician/facility performing the service.

Diver Name:			**Service Date:**
Facility Name:			
Regulator Make/Model	First Stage		
	Primary Second Stage		
	Alternate Air Source		
	Submersible Pressure Gauge		
	Depth Gauge/ Dive Computer		

First Stage Serial#:		**Alternate Air Source Serial #:**	
☐	Cleaning	☐	Cleaning
☐	Replace dynamic o-rings	☐	Replace dynamic o-rings
☐	Add/subtract washer (shims)	☐	Replace 2nd stage seat
☐	Replace first stage seat	☐	Lubricate
☐	Lubricate Properly	☐	Vacuum test
☐	Pressure Level & stability (lock up) IP____psi	☐	External leak test
☐	Low end IP check IP____psi	☐	Air-on orifice adjustment
☐	Water (leak) test	☐	VIVA checks
☐	Other:	☐	Diver controlled adj. knob check
Primary Second Stage Serial #:		☐	Inhalation (cracking) effort = _____ in. H2O
☐	Cleaning	☐	Exhalation (cracking) effort = _____ in. H2O
☐	Replace dynamic o-rings	☐	Overall breathing comfort
☐	Replace 2nd stage poppet/seat	☐	Hose and mouthpiece check
☐	Lubricate	☐	Other:
☐	Vacuum test	**SPG Serial #:**	
☐	External leak test	☐	Cleaning
☐	Air-on orifice adjustment	☐	Replace dynamic o-rings
☐	VIVA checks	☐	Lubricate
☐	Diver controlled adj. knob check	☐	Hose check
☐	Inhalation (cracking) effort = _____ in. H2O	☐	Other:
☐	Exhalation (cracking) effort = _____ in. H2O	**Depth Gauge/ Computer Serial #:**	
☐	Overall breathing comfort	☐	Cleaning
☐	Hose and mouthpiece check	☐	Check battery ☐ Replace battery
☐	Other _____	☐	Pressure test/ Depth calibration
☐	**LP Inflator hose check** ☐ **Drysuit hose check**	☐	Other:

Service Statement: All maintenance/repairs made according to manufacturer standards and procedures by, or under the supervision of, a sanctioned service representative.

Service Technician Name: _____ Signature: _____ Date: _____

Scientific Diver Assumption of Risk, Waiver and Release

(Read each paragraph and sign below)

I, _____, the undersigned, in consideration of the University of Maine System acting through the University of Maine (UMAINE) providing me with the opportunity to engage in scientific diving activities under UMAINE auspices, agree that:

_____ *(Initial)*

1. **I fully recognize and appreciate the dangers and hazards inherent in diving to which I may be exposed during diving**, including but not limited to arterial gas embolism, ear and/or sinus barotrauma, decompression sickness, drowning, near-drowning, and/or dysbaric osteonecrosis and other long-term effects, as yet poorly defined, and also during transportation to and from dive locations. I do hereby agree to assume all the risks and responsibilities surrounding my participation in diving or any independent research or educational activities undertaken as an adjunct thereto;

_____ *(Initial)*

2. **I understand that diving operations may be conducted at remote locations** at which a recompression chamber is not available and from which evacuation to such a chamber may be delayed by many hours.

_____ *(Initial)*

3. **My participation in diving is voluntary**; that I have the right and responsibility to refrain from diving if I feel the activity or conditions are not safe, that my fitness is not adequate for the dive, or for any other reason. I understand I will not be penalized in my employment or academic record for any such refusal.

_____ *(Initial)*

4. **My authorization to dive is a privilege granted upon compliance with UMAINE requirements.** I will follow the rules and precautions for conducting diving operations that are part of the requirements for my authorization to dive under UMAINE auspices, as set forth in the UMAINE Diving Safety Manual, as well as those procedures explained to me by the UMAINE Diving Officer, Lead Diver, or his/her agents. I understand that failure to comply may result in review, restriction, or revocation of my authorization to dive under University auspices by the UMAINE Diving Control Board.

5. **FURTHER, IF I PARTICIPATE IN DIVING ACTIVITIES THAT ARE NOT AN OFFICIAL ACT OF MY UMAINE EMPLOYMENT, OR IF I AM NOT A UMAINE EMPLOYEE:**

_____ *(Initial)*

a. **I do for myself, my heirs, executors, and administrators hereby RELEASE, WAIVE, DISCHARGE AND COVENANT NOT TO SUE** the University of Maine System, its trustees, officers, employees, agents, volunteers, and assigns from and against any and all claims, demands, and actions, or cause of action on account of damage to personal property, or personal injury or death which may result from my participation, and with or without the fault or negligence of the University, its trustees, officers, employees, agents, volunteers, and assigns during the period of my participation as aforesaid;

_____ *(Initial)*

b. **I agree to INDEMNIFY, DEFEND AND HOLD HARMLESS** the University of Maine System, its trustees, officers, employees, agents, volunteers, and assigns from and against any and all claims, demands, and actions for property damage or personal injury or death which may result from my participation and with or without the fault or negligence of the University, its trustees, officers, employees, agents, volunteers, and assigns during the period of my participation.

I affirm that I have read this statement and fully understand that by signing this form I may be giving up legal rights and/or remedies regarding any losses I may sustain. I agree that if any portion of this statement is held invalid, the remainder will continue in full force and effect. I agree that I have freely and voluntarily caused this release to be executed this _____ day of _____, _____.

Diver Signature: _____ Parent/Guardian Signature: _____
(if diver is under age 18)

Diver Name: _____ Parent/Guardian Name: _____

Scientific Diver Medical Consent and Insurability

I, _____, the undersigned, consent to and authorize any first aid provider, medical professional and others working under their supervision to treat me for any injury or illness occurring during my University of Maine System and University of Maine (UMAINE) affiliated diving activities.

Initial one of the following:

_____ **EMPLOYEE**: I am an employee of _____or other compensated affiliate or volunteer and I am authorized to conduct scientific diving as part of my official duties. Through my employment, **I am eligible for worker's compensation coverage** for job-related injury or illness incurred during my authorized diving activities under UMAINE auspices. As evidence of this, **I attach the Verification of Employment for Scientific Divers.**

_____ **NON-EMPLOYEE**: I am a student, or other uncompensated adjunct/affiliate of _____, who is **not eligible for worker's compensation coverage**. In consideration of being allowed to engage in scientific diving under University auspices, I agree to RELEASE, DISCHARGE AND HOLD HARMLESS the University of Maine System, its officers, agents, assigns, and employees from and against any liability arising from my participation or any claims or demands arising from or connected with such medical treatment or care. As evidence of insurability **I attach a copy of my insurance policy/card** which covers the cost of emergency transport and medical care for diving related injuries or illness. I agree to be responsible for payment of any and all medical expenses, costs and other charges not covered.

Member/Policy Number:_____ Coverage Level: _____ Expires: _____

EMERGENCY CONTACTS

1st Emergency Contact:	Relation:	Mailing Address:
Home Phone:	Work Phone:	
2nd Emergency Contact:	Relation:	Mailing Address
Home Phone:	Work Phone:	

Please list any Allergies or Sensitivities that may affect you in the field, or during emergency treatment (antibiotics, bee stings, etc.), of which the Diving Supervisor should be aware:

_____

With reference to any activities that are not a part of any official duties, **I affirm that I have read this form and fully understand that by signing this form I may be giving up legal rights and/or remedies regarding any losses I may sustain.** I agree that if any portion is held invalid, the remainder will continue in full force and effect. I agree that I have freely and voluntarily caused this release to be executed this _____ day of _____, _____.

Diver Signature: _____ Parent/Guardian Signature: _____
(if diver is under age 18)

Diver Name: _____ Parent/Guardian Name: _____

Verification of Employment for Scientific Divers

(to be completed on official letterhead of employer)

In consideration of the University of Maine System and University of Maine (UMaine) providing the employee named below with the opportunity to engage in scientific diving activities at UMaine diving sites or facilities, or use UMaine vessels and/or diving equipment, this document serves to verify that the employee named below is employed in a manner by which he/she is authorized to participate in scientific diving as part of his/her official duties and is eligible under applicable law or other statutory authority for worker's compensation benefits in the event of accident or injury resulting from the conduct of such diving activity.

Furthermore, the employer's responsible authority testifies that they agree to:

1. Maintain responsibility for administering worker's compensation benefits to the employee in the event accident or injury results while conducting scientific diving activities under the auspices of the University of Maine.

2. Indemnify and hold harmless the University of Maine System, its officers, employees, and agents, from all claims, demands and actions, including but not limited to costs, expenses and legal fees incurred in defending any such claims, demands, or actions, for damage to personal property, personal injury or death arising by reason of the negligent or other acts or omissions of the scientific diver.

3. Assume full responsibility and liability for tort claims and worker's compensation, to the fullest extent permitted by applicable law and/or statutory limits.

Employee Name: _____ Employee Title: _____

Employment Status: ❒ Full Time ❒ Part Time ❒ Temporary ❒ Other: _____

Employment Category: ❒ Faculty/Staff ❒ Student ❒ Volunteer ❒ Other: _____

Supervisor Name: _____ Supervisor Title: _____

Responsible Authority statement- *I certify that I am authorized to execute this verification of employment.*

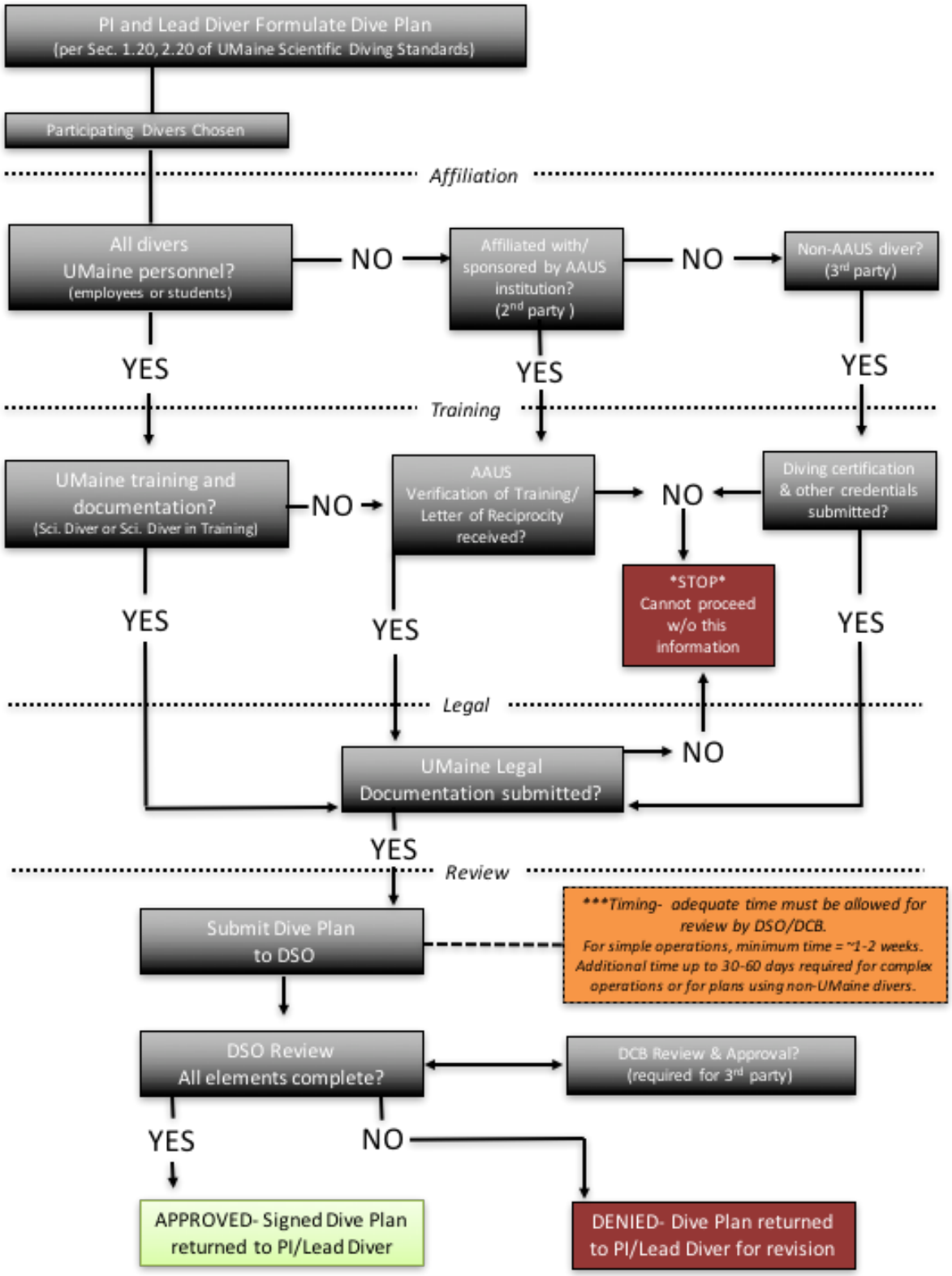
Responsible Authority Name: _____ Title: _____

Responsible Authority Signature: _____ Date: _____

Address: _____

Phone: _____ Fax: _____ Email: _____

Dive Plan Flowchart



Charter – Diving Control Board, University of Maine System
January 1, 2020

Authorization, Purpose, and Scope

The University of Maine System (UMS) hereby establishes and recognizes the UMaine Diving Control Board (DCB). The purpose of the DCB is to promulgate and administer policies and procedures to ensure adequate safety of all UMS related occupational and scientific diving. In support of this role, the DCB shall also serve to promote the availability and accessibility of diving education and training opportunities, in alignment with the academic and research missions of the University.

Responsibilities of the University

Duties and responsibilities of UMS include:

- Authorize and empower the DCB to oversee occupational and scientific diving at all UMS campuses and units.
- Recognize the "*absolute and autonomous authority of the DCB over the operation of the scientific diving program"* as required by OSHA.

Responsibilities of the DCB

The DCB shall ensure all occupational diving is conducted as required by the Occupational Safety and Health Administration [*29 CFR 1910.401(2)(iv)*]. As described in Appendix B to Subpart T of this regulation, UMaine will operate as exempt from this regulation for scientific diving activities. Scientific diving activities shall be conducted in accordance with the standards of the American Academy of Underwater Sciences (AAUS).

Duties and responsibilities of the DCB are outlined in the UMaine Scientific Diving Standards. These include:

- Manage and monitor all UMS occupational and scientific diving activities.
- Review, revise, and approve UMS diving standards in accordance with OSHA regulations and AAUS Standards.
- Initiate and manage disciplinary processes for unsafe diving practices or violation of University diving standards.
- Advise and delegate responsibilities to the Diving Safety Officer (DSO) as the coordinator/ manager of the program.

  NOTE: as described, the DCB may delegate portions of its roles and responsibilities to qualified individuals or subcommittees; however, the DCB may not relinquish oversight and accountability for these responsibilities.

Responsibilities of DCB Members

Duties and responsibilities of DCB members include:

- Regularly attend meetings and participate in DCB and associated sub-committee business.
- Maintain status as an active Scientific Diver (pertains to diving members only).

- Meet membership requirements as required by AAUS.

Membership

Membership in the DCB shall be open to UMS faculty, researchers, staff, and students with applicable diving expertise. The Board must be comprised of a majority of active scientific divers and should be representative of current scientific diving activities. Non-diving members of the DCB may include appropriate administrative or other personnel, including medical advisors, and legal or risk management representatives, however, a majority of active scientific divers must be maintained.

All DCB members have an equal vote in DCB business. Members of the DCB shall nominate and vote on new members; a DCB Chair will also be appointed to direct DCB activities and serve as a primary point of contact. The minimum number of DCB members shall be three, two of which must be active scientific divers; this minimum shall also constitute a quorum for the conduct of any essential business and/or votes.

In the event the number of inactive scientific divers (or non-divers) exceeds the number of active scientific divers, offsetting the requirement for a majority of active scientific divers, a separate DCB Advisory Board shall be established. The Advisory Board shall be comprised of inactive Scientific Divers (or non-divers) whose expertise is valued but whose presence on the DCB offsets the necessary majority of active scientific divers. Advisory Board members may participate in DCB discussions, but may not vote in DCB business.

DCB and/or Advisory Board members may excuse themselves from service at any time.

THE UNIVERSITY OF MAINE

ORGANIZATIONAL MEMBER OF
THE AMERICAN ACADEMY OF UNDERWATER SCIENCES

STANDARDS FOR SCIENTIFIC DIVING

**** SPECIAL ADDENDUM ***

COVID-19 Diving Procedures

Effective period: 1 March- 31 December 2021

UMaine Scientific Diving Program
COVID-19 Diving Procedures

Overview

Considering the continued impacts of the COVID-19 Pandemic upon University activities, the UMaine Diving Control Board is providing the following guidance and requirements for scientific diving operations. The guidelines set forth in this protocol have been adapted from various procedures within the national and international scientific diving communities, including the American Academy of Underwater Sciences (AAUS), Divers Alert Network (DAN), Undersea and Hyperbaric Medical Society (UHMS), National Park Service (NPS), University of California System, (UC), University of Hawaii (UH), and others. Much of this information is available online, but specific elements are not cited in this document. Additionally, in accordance with UMaine return to work procedures, a Hierarchy of Controls (HoC) worksheet is included in Appendix 1.

This guidance is considered current best practice. The situation continues to evolve and as such, changes to these practices may be required as new information becomes available. These guidelines do not replace or supersede Federal, State, or Local governmental policy or those of the University System or UMaine Facility administrators and safety coordinators; all such policies must be adhered to in addition to these guidelines.

Diving activities generally involve a high degree of personal contact in highly variable conditions. There is currently no peer-reviewed literature available demonstrating the potential risk of transmission when returning to diving operations, or the potential impact on individual diver health after contracting COVID-19. As such, while the following requirements are designed to help minimize disease transmission and lessen risk, they cannot be guaranteed to be 100% safe or effective; however, the scientific diving community is in agreement that diving operations can be conducted safely, when adhering to general protocols for minimization of group sizes, social distancing, face coverings, and general hygiene.

Return to Campus Procedures

All UMaine scientific divers must follow all
University and campus/facility-specific protocols for phased reopening and return to work. It is the responsibility of the PI and Lead Diver to ensure compliance with all University and site-specific protocols for returning to work. See DMC Protocol for 'Return to Campus' and 'Conducting Essential Research'; www.dmc.maine.edu (Appendix 2).

+++ Diving Operations +++
(Administrative)

Dive Plans
All Dive Plans approved or submitted prior to the posting of this addendum must be resubmitted for review and approval. The process for approving diving operations during COVID-19 will be as described below.

- ✓ **Step 1**- Approval from University OVPR for 'essential research' activity
- ✓ **Step 2**- Approval for 'return to campus' by campus administrators and safety coordinators
- ✓ **Step 3**- Dive Plan submitted to DCB and DSO; referencing approval of Steps 1&2
- ✓ **Step 4**- Dive plan incorporates/references dive-specific protocols for operations during COVID-19.

Diver Training and Qualification
All UMaine and AAUS standards for the training and qualification of scientific divers remain in effect. Pursuant to approval of the Dive Plan, current and active scientific divers may engage in diving activities for which they were previously qualified. Until the restriction on in-person training is lifted, divers new to the UMaine program will not be able to be trained or qualified.

All UMaine divers are required to complete *Emergency First Response (EFR)* "Airborne Pathogens Training". Please submit certificates of completion when submitting Dive Plans.
https://www.firstresponse-ed.com/stay-safe/

Reciprocity
Divers previously trained and authorized as Scientific Divers according to AAUS minimum standards will be authorized by UMaine if they can produce a Verification of Training/Reciprocity Letter with all elements complete, up to date, and verified. UMaine divers planning to travel to other institutions on Reciprocity should make arrangements well in advance to ensure operations are currently active. Be aware that receiving institutions may have more restrictive policies/procedures. Compliance with UMaine travel-policy is the responsibility of the PI.

Diver Medicals and Emergency Care Training
Divers whose periodic Diving Medical Exam and/or Emergency Care Training (CPR/FA, etc.) expired in 2020 were provided a grace-period to renew these elements through Dec. 31, 2020; this provision is not extended into 2021.

This exemption does not apply to any diver who has tested positive, or been presumed positive, diagnosed, or become ill with COVID-19. Any diver who has tested positive, or been presumed positive, diagnosed, or become ill with COVID-19 must undergo a full diver medical clearance prior to resuming diving and submit the newly approved medical exam documentation to the DSO.

As of 1 March 2021, all UMaine divers must also complete a COVID-19 Medical Assessment for Divers in addition to any/all required medical exams (Appendix 4).

+++ Diving Operations +++
(Operational)

General

- Follow all University policies for 'Return to Work', 'Essential Research', Minimization of Group Size, Social Distancing, Personal Hygiene, and use of Face-coverings /PPE.
- Limit the number of people in the dive locker, equipment room, drying and/or wash-down area at the same time; consider preparing and cleaning dive gear on a rotating schedule.
- Frequent and proper handwashing is encouraged throughout all phases of diving operations. *[If facilities are not available, portable hand sanitizer may be used. Alcohol-based sanitizers are discouraged due to fire/ignition risk; if alcohol sanitizers are the only option, all surfaces must be completely dry prior to handling dive equipment.]*

Equipment

- Each diver must use gear dedicated for their use only. Individual gear should be isolated as much as practicable during set-up, transport, break-down, and storage.
- Each diver will assemble and disassemble only their own equipment.
- All divers must have an 'octopus' as their secondary air source to share. Equipment configured with an 'Air2' must be modified to include an 'octopus'.
- All handheld equipment and field gear (when possible) should be cleaned/disinfected after use. See detailed procedures for Cleaning and Disinfection of Dive Gear.

  To the extent possible, the Sci. Diving Pgm will provide PPE and other necessary supplies (gloves, hand sanitizer, wipes etc.) for use in the Dive Locker. These materials will not be provided for field operations; PIs and Lead Divers must ensure these items are available in the field.

Dive Procedures

- To the extent possible, dives should be conducted with static buddy teams.
- Buddy checks and gear familiarization should be conducted from a standard social-distance of 6ft. Divers will inspect and functionally test only their own equipment.
- Water entry/exit should be conducted with masks and regulators donned and in place until social distancing can be achieved.
- If social distancing cannot be maintained, during surface-work, masks and regulators should remain in place.
- If conditions do not allow equipment to remain donned during entry/exit (i.e. exiting to a platform without a ladder), the diver should secure their equipment in the water, exit, and then retrieve their own equipment.

Emergency Equipment & Response

- Air-sharing between divers should be performed only with the 'octopus' unless doing so would result in injury or loss of life.
- In the event of an in-water rescue response, rescuer and victims mask and regulator should remain in place as long as is practical.
- All program-provided O2, First Aid kits, etc. will be prepared by the DSO following appropriate hygiene procedures.
    - Users must inspect FA kits prior to deployment.
    - Inspections must be performed while wearing gloves and face-coverings.
    - All returned kits must be externally disinfected by the user when returned.
    - Notify the DSO if any materials have been used.

+++ Cleaning and Disinfection of Dive Gear +++

- All divers are encouraged to watch Divers Alert Network on-line presentation "Disinfecting Scuba Equipment" or read DAN Article "Disinfection of Scuba Equipment and COVID-19".
- All personal dive gear will be cleaned/decontaminated according to the procedure below.
- Care must be taken not to cross-contaminate gear during and after cleaning. Divers should handle only their own gear. Do not touch masks, mouth pieces, etc. with unwashed hands.

STEP 1- Initial Rinse/Gross De-Con- with gear in personal totes, rinse all dive gear with running fresh water and allow to soak to remove sand, salt, and other debris.

STEP 2- Disinfect- disinfection of dive gear is recommended but not required. If divers are confident their gear has not been cross-contaminated, disinfection is optional. Divers who choose to disinfect should choose and follow one of the procedures listed below.

-Specific guidance for mixing/use of available disinfectants will be posted at the rinse station-

Disinfect (Bucket)- aliquot appropriate amount of disinfectant solution (TBD) into 3-5G bucket, fill with fresh water, submerge equipment, and allow to soak/stand for allotted time.

Disinfect (Tote)- drain initial rinse-water from personal tote. Aliquot appropriate amount of disinfectant solution into tote, fill with fresh water, submerge equipment, and allow to soak/stand for allotted time.

Disinfect (Spray)- hang gear on rack/rod and spray thoroughly with provided disinfectant. Allow to stand for allotted time.
**Spray recommended for exterior surfaces only, not regulators/snorkels.*

STEP 3- Final Rinse- rinse gear with running fresh water. ** if indicated by chosen disinfectant*

NOTE- during all phases of cleaning, water conservation should be considered. While cleaning and disinfection is a priority, divers should utilize care to minimize water-use and wastewater generation. This is particularly important at the UMaine Darling Marine Center.

+++ Breathing Air Cylinders and Fill Station +++

- All cylinders must be rinsed with running fresh water prior to being moved to the fill station.

- The number of operators at the Darling Marine Center fill station will be limited to one (1) at a time.

- Fill station operators must wash their hands prior to and after fill operations.
  **Due to the potential risk of fire, alcohol-based hand sanitizers/wipes are not to be used at the UMaine the fill station.*

- Fill station operators will wear face coverings or masks during fill operations.

- Cylinder valves and any/all fill station equipment handled by the fill operator must be disinfected prior to and after fill operations using disinfectant wipes or solutions provided. **Caution must be exercised to avoid injecting disinfectants and/or water into cylinders during/after the cleaning process.*

Appendix 1
+++Hierarchy of Controls Worksheet+++

See Excel attachment

Hierarchy of Controls- Scientific Diving Tasks (COVID-19)

CONTROL TYPE	Elimination Controls		Substitution Controls		Engineering Controls			Administrative Controls					Protective Equ	Special	
GROUPS / TASKS	Essential?	In person?	Lesser hazard	1 person?	Ventilation?	Mechanical Advantage?	Other Engineering Control?	Work Practice Controls	Off standard shift work?	Rotation?	Group Size / Distancing	Other Administrative Control?	Recommend PPE?	Face covering?	Cleaning/Disinfection
Scientific Diving															
Sci. Diving-Operational	If deemed so by OVPR	Yes	N/A	N/A	outdoors	N/A	N/A	Social distancing- 6ft when possible			Reduce to minimum number of dive team members + boat person (if	Consider shore dives in place of boat dives		Yes, while on shore/boat as practicable	See UMaine Sci. Diving SOP
Sci. Diving- Gear Prep/Cleaning	Yes	Yes	N/A	N/A	outdoors	N/A	N/A	Each diver handles and cleans only their own scuba equipment.		Divers clean equipment in 2 diver rotations; other team members conduct other tasks	Reduce to minimum number of dive team members			Yes, while on Dive Deck; in Dive Locker	See UMaine Sci. Diving SOP
Sci. Diving- Cylinder Filling	Yes	Yes	N/A	N/A	Indoor- ventillation fan	N/A	N/A			Rotate workers to maintain 1 person operations	1 person			Yes	See UMaine Sci. Diving SOP

Appendix 2

+++DMC Protocol for ‘Return to Campus’ and ‘Conducting Essential Research+++

Due to the potential for rapidly changing conditions, users should reference posted guidance at:
www.dmc.maine.edu

Appendix 3
+++Disinfection of Scuba Equipment+++

Disinfectant type- The UMaine Scientific Diving Program has chosen Simple Green DPro5 (DP5) for disinfection of scuba gear. This product is listed as a Tier 1 substance by the USEPA and is in compliance with EPA's *Emerging Viral Pathogen Guidance for Antimicrobial Pesticides,* during COVID-19.

SDS- The Safety Data Sheet for this product can be found in the UMaine Dive Locker SDS binder and is also posted at the Disinfectant station.

Instructions for Use

Spray bottles- 32 oz spray bottles are provided for use on hard surfaces in the Dive Locker and Air Fill Station only. These bottles contain ready-to-use, pre-diluted DP5 prepared by the Diving Safety Officer. If spray is needed and the bottle is empty, refill with pre-diluted stock, or follow instructions for dilution and mixing below.

Stock 1G containers- 1 Gallon containers of full-strength, undiluted DP5 are provided for dilution and mixing as noted below.

Dilution : Mixing Table- the table below lists ratios for preparation of DP5 disinfecting solutions.

Container	Simple Green D Pro 5	Dilute with water to
Spray Bottle	**1oz**	**32oz**
Pre-diluted	**2oz**	**1 Gallon**
5G Bucket	**4oz**	**2 Gallons** (5-6 inches of water per 5G bucket)
Fish tote	**10oz**	**5 Gallon** (3 inches of water per fish tote)

Contact time- allow a minimum 10-minute contact time for all equipment and surfaces to be disinfected prior to rinsing or wiping.

PLEASE CONSERVE!

During all phases of cleaning, conservation of both disinfectant and water should be considered. Disinfectant is in short-supply, and while cleaning and disinfection is a priority, divers should utilize care to minimize water-use and wastewater generation.
This is particularly important at the UMaine Darling Marine Center.

Appendix 4
+++UMaine Medical Assessment of Divers Following COVID-suspected Illness+++

Diver Name: _____ Date: _____

COVID-19 SYMPTOMS

Since January 2020: *(Please circle)*

1. Have you had a positive swab (PCR) or blood (antibody test) for COVID-19? NO YES
   If Yes, date of test(s): _____
2. Have you had any of the following symptoms and suspect they may have been related to COVID-19 Illness? (check all that apply) NO YES
   - ☐ *cough* ☐ *fever* ☐ *headache*
   - ☐ *shortness of breath* ☐ *chills* ☐ *loss of taste or smell*
   - ☐ *difficulty breathing* ☐ *shivering* ☐ *diarrhea*
   - ☐ *sore throat* ☐ *muscle aches*
3. Did you miss any days of work due to the above symptoms? NO YES
4. Have you had severe respiratory illness with clinical or x-ray evidence of pneumonia, or acute respiratory distress syndrome? NO YES
5. If YES to question 2-4, were you diagnosed with any respiratory illness other than COVID-19? If Yes, what illness: _____ NO YES
6. Are you having any symptoms currently? NO YES
7. Do you feel anxious or depressed about the COVID-19 pandemic or working? NO YES

EXERCISE TOLERANCE:

1. Describe your normal exercise routine: _____
2. Any changes in your ability to perform your normal exercise or exertion? NO YES
3. If YES to question 2, why can't you perform your normal exercise? _____

_____

If you answered ***'NO'*** to all of the questions above, and have a current *UMaine Diver Medical Exam* on file, no further evaluation is required. Please submit this form to the UMaine Diving Safety Officer.

If you answered ***'YES'*** to any of the above questions, additional screening by a medical provider is required. The screening should follow the recommendations for *Medical Assessment of Divers Following COVID-suspected Illness* found on page 2 of this document as well as the standard *UMaine Diver Medical Exam* and *Medical History Report.* When complete, please submit this form AND a newly completed UMaine Diver Medical Exam to the UMaine Diving Safety Officer.

PHYSICIAN'S STATEMENT: I have evaluated this individual according to the *Medical Assessment of Divers following COVID-suspected Illness* and provided my recommendations on the *UMaine Diving Medical Exam Overview for the Examining Physician.*

Physician Signature: _____, M.D./ D.O. Date:_____

Physician Name (Print): _____

Updated-UC San Diego Guidelines for Evaluation of Divers during COVID-19 pandemic

Charlotte Sadler, MD, Miguel Alvarez Villela, MD, Karen Van Hoesen, MD, Ian Grover, MD, Tom Neuman, MD, and Peter Lindholm, MD, PhD

Updated February 4, 2022

Background:

Coronavirus Disease 2019 (COVID-19) has become a global pandemic with SARS-CoV2 infecting millions of people and resulting in thousands of hospitalizations and deaths worldwide. Research examining the origins and structure of the virus, its pathogenesis, and the clinical features of its acute presentation is growing at a fast pace. However, as a nascent pandemic, the long-term sequelae to be expected in those who have survived the acute disease are largely unknown. SARS-CoV2 infection manifests primarily as atypical pneumonia, but in severe disease other complications are common, including cardiac and thromboembolic disease.

Scuba diving is a passion for many recreational divers, but, more importantly, it also represents a critical component of the commercial diving industry and scientific research. UCSD runs a diving medicine clinic that sees approximately 250 divers per year, most of whom are employed as commercial and scientific divers. As society begins to re-open after quarantines, many of these divers are presenting to our (and others') clinic requesting guidance and clearance on returning to dive after the pandemic.

COVID-19 and Diving:

We are presented with the challenge of performing fitness to dive evaluations in the context of a disease in which the natural history is still unknown, though more information is becoming available. In what we know of the pathophysiology of the disease, the pulmonary, cardiac, and thromboembolic/hypercoagulable disease seems to be relevant to divers. Potential long-term sequelae include decreased exercise tolerance, increased susceptibility to cardiac events such as heart failure, pulmonary edema, and arrhythmia, structural changes of the lung leading to increased risk for barotrauma, and increasedrisk of decompression sickness from underlying hypercoagulability.

We originally developed these guidelines in May of 2020 and the current landscape of the pandemic has significantly changed since that time. We have seen the development of vaccines that protect divers/people from infection, severe disease, and death. We have also witnessed the evolution of a virus into various strains, including some variants that are more contagious and some that seem to cause both more and less severe disease.

The situation has also changed significantly with the massive surge in cases due to the Omicron variant resulting in many divers who require rapid clearance to return to work. In addition, many only report symptoms like the common cold, which appear to be much milder than the original infection. In light of these developments, we recognized an amendment of our guidelines is needed.

The modifications to our guidelines were developed in a response to the challenges noted above and what we have observed clinically. In our experience, as well as information gathered from very limited publications, it appears that in cases where the disease causes only upper respiratory symptoms, there are limited long term sequelae or complications. We have also noted the publication of multiple recent reports suggesting that a percentage of young and otherwise

healthy patients who recover from mild or asymptomatic COVID-19 illness, may have surrogate findings of myocardial inflammation or damage on cardiac MRI. These findings are, however, of unclear clinical and prognostic significance. Our recommendations remain centered around the presence of cardiac symptoms or exercise limitations to guide further testing. Consequently, we have adjusted to treating such cases in a similar nature as we would other uncomplicated seasonal, upper respiratory viruses.

A few things should be noted-first, recommendations for those with moderate or severe disease have not changed. Second, as with our original guidelines, we strongly emphasize that these amendments are only applicable to those who have recovered from their acute illness, are completely asymptomatic, and back to their baseline exercise capacity.

Our goal has been to categorize divers based on the history and severity of their illness and base their return to dive evaluation accordingly. As with any illness, ultimately the work up is left to the discretion of the evaluating physician. Our plan is to continue to update them f= as we gain more experience and more evidence becomes available. The following guidelines are referring to divers who are ***completely asymptomatic*** after their illness, including exercise tolerance (see below). Before using the guidelines below, a few terms warrant definition:

Definitions of terms used in guidelines:

COVID-19-suspected Illness

We define a COVID-19-suspected illness as a diver who had symptoms consistent with COVID-19 with or without a positive PCR or rapid antigen, given that testing is still not universally available or reliable. We are currently using the CDC case definition (updated Aug 24, 2021) of COVID-19 for those patients who did not have PCR or rapid antigen confirmed illness:

In the absence of a more likely diagnosis:

- Acute onset or worsening of at least two of the following symptoms or signs:
- fever (measured or subjective),
- chills,
- rigors,
- myalgia,
- headache,
- sore throat,
- nausea or vomiting,
- diarrhea,
- fatigue,
- congestion or runny nose.

OR

- Acute onset or worsening of any one of the following symptoms or signs:
- cough,
- shortness of breath,
- difficulty breathing,
- olfactory disorder,
- taste disorder,
- confusion or change in mental status,
- persistent pain or pressure in the chest,
- pale, gray, or blue-colored skin, lips, or nail beds, depending on skin tone,
- inability to wake or stay awake.

OR

Updated GUIDELINES FOR DIVER EVALUATION:

Category 0 ***NO*** *history of COVID-19 suspected illness*	*Category 0.5* ***VERY MILD*** *COVID-19-suspected illness*	*Category 1* ***MILD*** *COVID-19-suspected illness*	*Category 2* ***MODERATE*** *COVID-19-suspected illness*	*Category 3* ***SEVERE*** *COVID-19-suspected illness*
Definition: No history of COVID-19 or asymptomatic positive screening test	Definition: • **isolated upper respiratory or systemic symptoms (rhinorrhea/ congestion/ pharyngitis/ loss of taste or smell), fevers, fatigue, or myalgias but WITHOUT lower respiratory or cardiac symptoms.** • Returned to baseline exercise tolerance.	Definition: • **Symptomatic COVID-19 including any of the following: Any lower respiratory or cardiac symptoms, including chest pain, palpitations, significant* cough, shortness of breath with exertion or at rest.** • outpatient treatment only without evidence of hypoxemia. • Did not require supplemental oxygen • Imaging was normal or not required • Returned to baseline exercise tolerance.	Definition: • Required supplemental oxygen or was hypoxic • had abnormal chest imaging (chest radiograph or CT scan) • admitted to the hospital but did NOT require assisted ventilation (BIPAP, CPAP, or ventilator) or ICU level of care. • If admitted, had documentation of a normal cardiac work up including normal ECG and cardiac biomarkers e.g. troponin or CK-MB and BNP • Returned to baseline exercise tolerance.	Definition: • Required mechanical or assisted (CPAP, BIPAP) ventilation, or ICU admission • Cardiac involvement defined as abnormal ECG, abnormal echocardiogram, or elevated cardiac biomarkers; e.g. troponin or CK-MB and BNP (or absence of documented work up) • Thromboembolic complications (such as PE, DVT, or other coagulopathy) • Returned to baseline exercise tolerance.

*for example, cough that is productive, prevents from sleeping, or requires medication, ultimately defined at the discretion of the evaluating physician

Other factors may be taken into consideration including vaccination status, as there is evidence that breakthrough infections in those vaccinated against COVID-19 results in milder disease, and regional prevalence of variants (omicron vs delta, etc).

- Severe respiratory illness with at least one of the following:
- Clinical or radiographic evidence of pneumonia,
- Acute respiratory distress syndrome (ARDS).

Exercise Tolerance

This is likely the most important definition used in our guidelines and it is vital that physicians evaluate it carefully. It is our belief that a diver with significant cardiac or pulmonary pathophysiology would not have a normal exercise tolerance. However, the definition of the word normal is critical. First, the diver must have returned to his or her baseline level of exercise and tolerance. Even minor deviations from their baseline ("getting more winded," longer recovery times, etc) warrants further testing and investigation. Second, the physician must be satisfied that the diver's exercise regimen warrants an appropriate exertional test for diving. There are no universally agreed upon recommendations on an exercise tolerance level needed for all divers, but the ADCI guidelines for commercial divers require a minimum level of 10 METS. If the physician is not convinced that the diver's self-reported exercise level meets appropriate criteria or concerned that it would not reveal underlying cardiac or pulmonary disease, further testing is warranted.

Category 0 ***NO*** *history of COVID-19 suspected illness*	*Category 0.5* ***VERY MILD*** *COVID-19-suspected illness*	*Category 1* ***MILD*** *COVID-19-suspected illness*	*Category 2* ***MODERATE*** *COVID-19-suspected illness*	*Category 3* ***SEVERE*** *COVID-19-suspected illness*
• Initial/annual exam per ADCI/AAUS /NOAA /RSTC guidelines • Chest radiograph only if required per ADCI/AAUS /NOAA/ RSTC guidelines No additional testing required	• Initial/annual exam per ADCI/AAUS /NOAA /RSTC guidelines • Chest radiograph only if required per ADCI/AAUS /NOAA/ RSTC guidelines No additional testing required	•Initial/annual exam per ADCI/AAUS/ NOAA /RSTC guidelines • Spirometry • Chest radiograph (PA & Lateral) if abnormal, obtain Chest CT • If unknown (or unsatisfactory) exercise tolerance, perform exercise tolerance test with oxygen saturation	• Initial/annual exam per ADCI/AAUS/ NOAA /RSTC guidelines • Spirometry • Chest radiograph (PA & Lateral) if abnormal, obtain Chest CT • ECG • Echocardiogram (if no work up was done as an inpatient. Can forgo if had negative work up) • If unknown (or unsatisfactory) exercise tolerance, perform exercise tolerance test with oxygen saturation • Investigation and management of any other complications or symptoms per provider and ADCI/AAUS/NOAA/ RSTC guidelines	• Initial/annual exam per ADCI/AAUS/ NOAA /RSTC guidelines • Spirometry • Chest radiograph (PA & Lateral) (if abnormal, obtain Chest CT) • ECG • Repeat Cardiac troponin or CK-MB and BNP to ensure normalization • Echocardiogram • Exercise Echocardiogram with oxygen saturation • Investigation and management of any other complications or symptoms per provider and ADCI/AAUS/NOAA/ RSTC guidelines

Symptomatic divers or those with abnormal test results

It is not currently our plan to allow divers who are symptomatic or have abnormal testing per the guidelines above to dive (though each will need to be evaluated on a case by case basis and exceptions are to be expected). However, we do not feel this necessarily represents a lifetime ban on diving as many of the sequelae which are currently disqualifying (such as abnormal CT scans) may resolve over the next 3-6 months and re-testing may be indicated. It is currently unknown whether or not potential sequelae of COVID-19 will become chronic and therefore re-evaluation will likely be indicated until more evidence becomes available.

Screening of diving employees prior to diving

We currently recommend following CDC guidelines for screening of an employee prior to diving and do not feel that measuring vital signs or oxygen saturation routinely before diving are warranted.