UNOLS Shipboard Scientific Diving: 2026 Review

Recommended Actions and Supporting Analysis

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Background

The 1990 URI/GSO Workshop on Scientific Shipboard Diving and the 1996 Addendum span 35 years of institutional thinking on shipboard scientific diving safety. The core governance architecture established in those documents remains sound. What has shifted is the operational and regulatory context: blue water scientific diving from the ARF has become infrequent enough to erode institutional knowledge and infrastructure readiness; remote coastal and island operations have grown in importance, often relying on vessels of opportunity; RVSS Chapter 11 — the operative governance document — has gaps and anachronisms that now need attention; and the AAUS is actively being encouraged to revise its lead diver role definitions (to reflect that adopted within the UC Systemwide Scientific Diving Programs), creating a timely opportunity to align UNOLS language with emerging national standards while pushing the field toward greater specificity for shipboard operations.

This document reorganizes the analysis from prior reviews around seven concrete recommended actions, followed by the supporting analysis for each.

Part I: Recommended Actions

Action 1: Revise Lead Diver Terminology and Role Structure

- Replace "On-Board Diving Supervisor" with "On-Site Lead Diver" throughout RVSS Chapter 11.
- Formally request that the AAUS codify a three-tier structure (Buddy Team Leader / On-Site Lead Diver / Project Dive Leader) in its standards and align UNOLS/RVSS language with the adopted AAUS definitions.
- Define UNOLS-specific competencies and responsibilities for the On-Site Lead Diver role appropriate to ARF shipboard operations, drawing on the WHOI On-Board Diving Supervisor qualification framework.
- Rewrite or remove RVSS Section 11.4 in its current form.

Action 2: Develop a Standard Pre-Cruise Dive Plan Criteria

- Develop UNOLS standard Pre-Cruise Dive Plan criteria defining minimum required content for shipboard diving from ARF vessels.
- Model the template on the WHOI and UC System dive plan frameworks, incorporating contemporary AAUS risk identification and mitigation language.
- Recommend integration with the hosting vessel's Safety Management System (SMS), particularly for emergency medical response, evacuation procedures, and onboard resource inventories.

- Recommend a completed dive plan as a condition of cruise scheduling. Final approval from the PI's Diving Safety Officer (DSO)/Diving Control Board (DCB) with consent of the host's DSO/DCB is required pre-departure.

Action 3: Establish Small Boat Training and Qualification Standards

- Recommend all small boat operators supporting diving operations from ARF vessels to hold current certification under the Scientific Boating Safety Association (SBSA) program (based on the DOI/USFWS Motorboat Operator Certification Course), equivalent, or documented appropriate for the operational requirements.
- Recommend supplemental competency in: live-boat operations; diver tracking; diver recall and recovery; and Diving First Aid including oxygen administration.
- Integrate small boat standards for diving support into RVSS Chapter 11 or as a dedicated appendix, cross-referenced in both the diving and small boat sections of the RVSS.
- Recognize that general mariner competency does not transfer to small-boat diver support operations; UNOLS operator marine technical staff and crew should not be assumed qualified without demonstrated training.
- Various UC campuses and other SBSA member institutions are available to provide qualifying and supplemental training.

Action 4: Mandate Small Boat Redundancy and Equipment Standards

- Recommend a minimum of two operational small boats whenever divers are in the water away from the mother vessel.
- Recommend each dive support boat to carry: redundant VHF radio communication; a tested diver recall device appropriate to the operating environment; medical grade oxygen with delivery system; a basic marine first aid kit; and a diver down flag.
- Recommend the Pre-Cruise Dive Plan to include an explicit contingency procedure for primary small boat failure, including ship-side diver recovery.
- For ARF vessels without standing small boat diving support capability, recommend Zodiac MKV HD platforms as the preferred asset: large, stable, portable, and compatible with crane launch and recovery from most ARF vessels.

Action 5: Develop Shared ARF Diving Support Infrastructure

- Query all UNOLS operators to inventory available small boat assets, breathing gas compressor systems, cylinder banks, and emergency first response supplies that may serve as shared or pooled resources across the ARF.
- Where individual vessel operators lack required diving support infrastructure, UNOLS should fund development of shared-use containerized diving support assets deployable fleet-wide.
- A containerized system should include at minimum: a breathing gas compressor with nitrox capability and redundant backup; gas storage banks and cylinder inventory; at least two crane-compatible RIBs with motors and communications; and a diving emergency oxygen kit sufficient for field-to-evacuation coverage.
- Designate one UNOLS operator (WHOI or SIO/UCSD recommended) to host and manage shared assets.

Action 6: Strengthen Emergency Planning Requirements

- Formalize shared emergency planning responsibility: the Chief Scientist's DSO/DCB develops the emergency plan in coordination with the On-Site Lead Diver; the plan must be endorsed by the operator based on the vessel SMS.
- Recommend identification of medical advisory contacts specific to diving related injury for each cruise operating area (DAN Emergency Services; UCSD Diving and Hyperbaric Medicine or equivalent).

- Require identification of the nearest hyperbaric treatment facility for the specific cruise area, updated for each cruise.
- Require an oxygen supply calculation demonstrating sufficient medical grade oxygen to provide continuous first aid from site of injury (small boat) through vessel transport and evacuation to definitive care.
- Extend Diving First Aid certification (DAN Diving First Aid for Professional Divers or equivalent) to all small boat operators, marine technical staff supporting diving, and relevant ship's crew — not only scientific divers.
- Require an emergency briefing with all dive team members and relevant crew at cruise start; recommend emergency drills on all diving cruises.

Action 7: Establish a Periodic Review Cycle

- Convene a UNOLS subcommittee for Diving and Small Boating Safety to advise the UNOLS Safety Committee and the hosting institution on matters of scientific diving and associated small boating safety and operational considerations.
- Convene a joint UNOLS/AAUS ad hoc working group to produce updated RVSS Chapter 11 language and associated guidelines, targeting publication in 2026 or 2027.
- Coordinate timing with the AAUS three-tier lead diver standards revision currently underway to ensure document alignment.
- Establish a review cycle not to exceed ten years; the next full review should occur no later than 2036.

Part II: Supporting Analysis

1. Authority, Responsibility, and the On-Site Lead Diver Role

Current state of RVSS Chapter 11

Sections 11.1 and 11.2 are sound and provide adequate clarity around basic program structure and diving authorization. Section 11.3.1 is workable with the caveat that dive planning content requirements need greater specificity (see Section 2 below). Section 11.3.2 requires substantive revision. Section 11.4 should be removed or comprehensively rewritten — it is currently without useful content.

The terminology gap

The term "On-Board Diving Supervisor" does not appear in AAUS standards. Its continued use in the RVSS creates a disconnect with the standards framework UNOLS nominally defers to and obscures the actual scope of the role. Revision to "On-Site Lead Diver" aligns with the emerging AAUS three-tier framework and better describes the on-site operational character of the role.

The three-tier framework

The proposed AAUS lead diver role definitions — intentionally minimal to allow member organizations to define specifics based on operational context — establish three roles that might help UNOLS align the "On-Board Diving Supervisor" role with the proposed AAUS language of "On-Site Lead Diver." While it is possible for one person to fill all three roles, the PI's DSO/DCB determines who is authorized for each role during the dive plan approval process, as does the hosting organization's DSO/DCB. The following language is proposed to the AAUS and is being adopted within the UC Scientific Diving Programs systemwide:

***Project Dive Lead**, responsible for the scientific diving project and:*

- *Acts as the primary point of contact with the DSO.*
- *Responsible for the development of the Dive Plan.*
- *Ensures all dive team members possess current authorization and are qualified for the type of diving*

operation.

- *Appoints the On-site Lead Diver.*

***On-Site Lead Diver**, responsible for the diving operation and:*

- *Ensures dives are conducted in accordance with the PI's Institutional and AAUS Standards.*
- *Coordination with other known activities in the vicinity that 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.*
- *Reporting to the DCB, through the DSO, any physical problems or adverse physiological effects including symptoms of pressure-related injuries.*

Buddy Team Leader:

- *For each buddy team, one team member shall be designated the Buddy Team leader with responsibility for coordinating equipment, positioning, navigation, monitoring gas and time milestones, and communication with the On-Site Lead Diver.*

The staffing reality

UNOLS operators will generally not have staff with the experience or availability to serve as On-Site Lead Diver for the duration of a research cruise. This reality should be stated plainly in the revised RVSS rather than left as a tacit assumption. The On-Site Lead Diver will almost exclusively come from the PI's home institution, must be approved by that institution's DCB, and must be accepted by the UNOLS operator's diving program. This should be stated explicitly in the revised RVSS with the institutional approval pathway clearly defined. If all stakeholder concerns about supervisory qualifications cannot be resolved, support for diving operations should not proceed.

2. Dive Planning and Multi-Institutional Cruise Coordination

The existing multi-institutional coordination chain established in 1990 and codified in RVSS Section 11.3.1 remains structurally sound: PI/Lead Diver prepares dive plan, home institution DSO/DCB approves, the UNOLS operating institution DSO/DCB approves, operator Marine Office receives no fewer than 30 days prior to cruise. The primary gap is the absence of defined minimum content requirements for the dive plan itself.

The UNOLS Blank Pre-Cruise Dive Plan — recommended in both the 1990 report and 1996 addendum — has effectively disappeared from active use. Contemporary AAUS dive planning practice incorporates explicit risk identification and mitigation frameworks that the original template did not reflect. The WHOI and UC System frameworks represent the current state of practice and should anchor a revised UNOLS standard.

Each UNOLS hosting vessel operates under a Safety Management System addressing emergency medical response, resources, and procedures. The dive plan should explicitly reference and build from the vessel's SMS rather than treat emergency planning as a standalone exercise.

3. Small Boats and Small Boat Operators

Small boat operations in direct support of scientific diving are among the highest-risk elements of shipboard diving programs and have been the most consistently under addressed area across all three document generations. The 1996 addendum's recommendations on small boats were never adequately implemented. UNOLS operators currently have no consistent or defensible approach to small boat training, qualification, or equipment standards for diving support operations.

Big-ship expertise does not transfer to small-boat operations. The operational demands of live-boating divers in remote, dynamic coastal or blue water environments — diver tracking, live-boat maneuvering in close proximity to divers, diver recall and recovery, emergency response far from the mother vessel — require specific training that mariners do not typically receive. Qualified small boat operators are routinely an afterthought in dive project planning, despite playing a role in operational safety equal to that of the dive team itself.

The AAUS community has broadly adopted SBSA standards (or equivalent), grounded in the DOI/USFWS Motorboat Operator Certification Course, as the baseline for scientific small boat operations. This is the appropriate foundation for UNOLS. The redundancy principle is simple: if you need one, you need two — boats, engines, communications, etc.

4. Diver Training and Evaluation Standards

This area requires no fundamental revision. AAUS standards remain the authoritative baseline. Responsibility for diver training and institutional authorization rests with the Chief Scientist's DSO/DCB. The operator, vessel Master, and operator's DSO/DCB validate authorization against AAUS standards and institutional policies. Any additional training, authorization, or supervision requirements must be resolved by all stakeholders before departure. Divers who do not meet qualification criteria shall not be permitted to dive.

UNOLS should track compliance with the longstanding recommendation that all member institutions engaged in scientific diving or vessel operations maintain AAUS Organizational Membership, and update procedural language for managing divers from institutions without AAUS-model programs to reflect current AAUS reciprocity mechanisms.

5. Emergency Planning

Emergency planning responsibility is shared: the Chief Scientist and their DSO/DCB develop the emergency plan in coordination with the On-Site Lead Diver, and the operator endorses it based on the vessel's SMS-defined medical capabilities and evacuation infrastructure. The emergency plan is not a standalone document — it is an integration of the cruise dive plan with vessel SMS resources.

AAUS standards require all scientific divers to hold current Diving First Aid certification (CPR/AED, oxygen administration, first aid with emphasis on hazardous marine life and trauma). DAN Diving First Aid for Professional Divers is the recommended baseline. This standard should be extended to all small boat operators, marine technical support staff, and relevant ship's crew — the site of a diving injury is often a small boat far from the vessel, and the first responders present may be boat operators, not divers.

Medical grade oxygen must be sufficient to provide continuous first aid from the point of injury through small boat transport, vessel transfer, and evacuation to definitive care. This calculation should be explicit and documented in the dive plan. Medical advisory contacts and area-specific hyperbaric facilities and evacuation routes should be identified for each cruise operating area specifically — not as generic entries.

6. Recompression Chambers

The AAUS position remains unchanged: normal at-sea scientific diving from UNOLS vessels does not require an on-board recompression chamber. Enriched air nitrox (EAN) further reduces decompression risk and should be standard where infrastructure supports it.

Where the pre-cruise decompression risk assessment identifies elevated risk that cannot be adequately mitigated — including planned staged decompression, mixed-gas rebreathers, or high-repetition deep diving programs — and where scientific value and team qualifications justify accepting greater risk, a portable chamber should be evaluated. Portable systems capable of providing U.S. Navy Treatment Table 6 are available (e.g., SOS Hyperlite SL3); infrastructure and qualified operators may be contracted on a case-by-case basis. UCSD Diving and Hyperbaric Medicine is available as an expert advisory resource for chamber deployment decisions.

7. New Technologies and Periodic Review

The 30-year gap between the 1996 addendum and this review reflects an institutional failure to maintain the review cycle recommended in the original 1990 report. Technologies, standards, and operational contexts have evolved substantially: dive computers, enriched air nitrox, closed-circuit rebreathers, advanced mixed gas, and portable hyperbaric systems have all entered routine or near-routine scientific diving practice since the last formal review.

A joint UNOLS/AAUS working group should be convened promptly to produce updated guidelines, coordinated with the AAUS three-tier lead diver standards revision currently underway. A mandatory 10-year review cycle should be established and enforced.

This document draws on: Final Report of the Workshop on Scientific Shipboard Diving Safety (URI/GSO, 1990); Scientific Shipboard Diving Safety Addendum Report (UNOLS, 1996); UNOLS Shipboard Scientific Diving Comments (McDonald, May 2023); and supplemental review notes (McDonald/O'Brien, 2026). Prepared for working group review in advance of RVSS Chapter 11 revision.