E-SLATE

American Academy of Underwater Sciences (AAUS)

EDITORIAL NOTE – December 2012

Welcome to the December E-Slate. As we wrap up 2012, I would personally like to thank all of you who have helped to make this year a success for AAUS! Many of you have volunteered your time to work on projects, serve on the board, put on the symposium, contribute to the E-Slate and support the Academy in all of our activities this year. It has been a pleasure working with all of you and I look forward to another great year in 2013! This issue has a great article about scientific diver training, announces award winners, a new scholarship and highlights another OM. Submit an electronic version of your poster from 2012 poster night and we will highlight your program in the coming months! We encourage you to participate in the online forum as well as submitting new publications to share with the membership. In addition, we welcome news, announcements, job postings, and images of underwater work at aaus@disl.org. Please also note that our new website is live! As you submit information for the E-Slate, it will now also be posted on the new site. Current and past issues of the E-Slate are available at www.aaus.org.

Learning To Be a Scientific Diver

by Maria Kyong

When I signed up for a the two-week AAUS summer intensive science diver course I have to admit I was not sure what to expect. I wondered if it would be like living out one's childhood fantasy of being a marine biologist for a day or like that nightmare where you're back into school totally unprepared and in over your head.

Having absolutely no background in the sciences (marine or otherwise) and only being a recreational diver for about 4 years I was surprised to find I was able to take the course. I came across the course through BluePlanetDivers.org at a point in my diving 'career' where I wanted the time I spent diving to contribute to something and wanted to learn more about the things I so loved to see underwater. So, stars were aligned and I learned about the course and was able to sign up just weeks before it started.

The course was run by Diana Steller and Scott Gabara of Moss Landing Marine Labs in conjunction with CSU Monterey and consisted primarily of students (undergrad and postgrad) that were studying and working in various areas of marine biology, ecology, and the like. It was a small group, less than a dozen participants of varying age and experience in diving and science. We had a week of lab sessions in the pool, classroom, a few dives at Breakwater, and lots of figuring out gear, supplies, and logistics for the following week 'in the field.' The following week we loaded up a van and truck including two dozen steel tanks, air compressor, dive gear, camping gear, food, training material, and 12 eager bodies and were off to Big Creek in Big Sur for six days of diving, camping, and learning to be science divers!

Here is where reality hit... we stood inside the gates looking at the long rocky path down to the beach and wondering how we were going to set up air compressors, fill tanks, and transport gear, a Zodiac, kayaks, etc., over rocks and poison oak for the next six days then make the mile trek up to our campsite to set up camp. Much like the rest of the week things that seemed impossible at the start just seemed to work out. Any dismay about the work ahead of us was quickly dismissed by the awe of this incredible site.

The next six days were a blur... waking up at 0600 to get coffee and food prepped for a full day at the beach, getting dive teams, learning to navigate the site while learning protocols for Reef Check (some were learning algae for the first time, some were still learning to dive, operate an air compressor or fill tanks, learning how to launch an Zodiac or kayak from a very rocky entry...), managing equipment issues, minor injuries, etc. We left camp at 0800 in the morning, walking a mile to the dive site each day and returned to camp 10 hours later with just enough energy left to try to put on an evening meal and a fire. If we were able to sit around the camp fire for a bit before making it back to our tents to crash we got to check in and talk about the amazing moments, calamities, and 'other' experiences of the

day. Before you knew it we were talking about our last day at Big Creek... where did the week go?

Like I said, it was a blur. Driving back to Monterey on Sunday afternoon fighting sleep I could not take it all in. Weeks later I am sorting through notes on Reef Check protocol, algae identification, and pictures of the week and making plans to do my next practice survey.

NEWS/ANNOUNCEMENTS

NOGI Award

Phil Lobel, Boston University

Dr. Phillip Lobel (PhD, Biology, Harvard University, 1979) is an Ichthyologist and Professor of Biology in the Boston University Marine Program.

Phil learned to scuba dive from his father in Lake Erie, Ohio at age 12 in 1965. He started as a volunteer at the Cleveland Aquarium at age 14 where he met scientists who took him scuba diving to collect fishes and sharks in the Florida Keys during summers. This is when he really knew he wanted to be a marine biologist. At age 17, he traveled by himself into the Amazon jungle for six weeks where he met an old Amazonian Indian and the two of them canoed the jungles looking for fishes to collect. He worked during school vacations, as the assistant lab manager at UH's Enewetak Atoll Marine Lab serving as a dive buddy for visiting scientists and "riding shotgun" with a McNair powerhead for protection from sharks (that was a long time ago!). He was the first to observe angelfishes and butterflyfishes spawning in the wild.

He was the first to map a Hawaiian Ocean eddy in real time and to show how open ocean eddy currents could transport fish larvae from reefs and back again. The next huge discovery by Phil was made when he developed a specialized hydrophone and coupled it to a first generation 8-mm video camera in an underwater housing. While it was known that some fishes made loud courtship or aggressive sounds, Phil found that several (including hamlets and parrotfishes) also made quieter specialized spawning sounds that most scuba divers and aquarists never hear.

He established the Johnston Island marine research laboratory and led the research team that evaluated the impact on the marine environment from the US Army's prototype facility for the destruction of chemical weapons and nuclear weapons fallout which resulted in the Dept. of Defense Coral Reef Protection Implementation Plan.

He has been featured in two National Geographic TV shows about his work on shark behavior at Johnston Atoll and in Palau. He has discovered several new species of fishes in Hawaii, the Line Islands, Wake Island, and Belize. His wife, Lisa Lobel, PhD is also an accomplished marine biologist. They have co-authored several papers.

DAN Members Choice Awards

Vallorie Hodges, Oregon Coast Aquarium

"For the hundreds of scientific divers that Vallorie Hodges has trained and supervised at the Oregon Coast Aquarium, our dive safety officer's name is synonymous with an unrelenting attitude of putting diver safety above all other concerns in the full range of open water and industrial conditions in which we make our contribution to the aquarium's mission. I personally feel Vallorie has fostered an awareness and practice of dive safety in all my diving, both on and off duty."

DAN member choice awards were selected by public nomination. They have been recognized by the diving community for their dedication to establishing a culture of dive safety.

New AAUS Scholarship Program
Hollis Gear Award

Hollis Gear (www.hollisgear.com) has graciously offered to fund a new scholarship program for AAUS student members. Awards are valued at $1250 per recipient ($1000 in Hollis diving equipment plus $250 to cover dive training or academic diving travel costs). Up to two awards will be provided annually. This will be a competitive program, with qualified applicants (AAUS members and accepted or enrolled students) submitting brief proposals (3-5 pages; including rationale for support and budget [note: the ability to secure matching funds will strengthen the application]) and a letter of support from a faculty advisor. Proposals will be due on June 30; winners will be announced October 01. Further information will be available on the AAUS (www.aaus.org) and AAUS Foundation (www.aausfoundation.org) websites.

Hollis Gear AAUS OM Purchasing

In addition to the Hollis Gear Award, Hollis is offering dealer level institutional pricing to all AAUS organizational members (OM). A complete price list is attached and a product catalogue is available at www.hollisgear.com. All orders must be placed using account #732 with purchase orders placed by the OM's DSO or a designated purchaser. For questions or to place orders please contact Hollis Gear: 2002 Davis Street, San Leandro, CA 94577; 510-729-5110(voice); 510-7295115 (fax); sales@HollisGear.com.

Call for Papers

Marine Technology Society Journal - Technologies and Techniques for 21st Century Wet Diving (Nov/Dec issue)
Special Issue Guest Editor: Michael Lombardi, Ocean Opportunity Inc. and Lombardi Undersea Resource Center

Issue Description and Topics Sought: While humans have pursued intervention of the ocean for centuries, the 20th century in particular gave rise to unprecedented accessibility. The advent of scuba in the 1950s allowed any person with an inquisitive mind to visit the underwater world. This sole pursuit of setting foot in *oceana incognita*—an unknown ocean—has since opened countless opportunities in industry, academia, for defense strategies, and for recreation and entertainment. This special issue of *MTS Journal* will focus on the current state of diving technologies and techniques crossing all industry sectors, emphasizing current advancements, limitations, and newly exposed opportunities. Paper priorities will be given to topics including closed-circuit rebreathers, underwater habitation, decompression theory and modeling, training standards, undersea intervention techniques, new methods for diver-based scientific and commercial data gathering, and carrying out complex tasks in extreme environments.

Information for submitting manuscripts can be found at https://www.mtsociety.org/author_info. Authors who intend to submit a manuscript must complete an author information form (available on the website listed above) and return it to Amy Morgante morganteeditorial@verizon.net as soon as possible. For comments, suggestions, or requests, please send email to editor@mtsjournal.org

2013 AAUS/OWUSS Internship

OWUSS is now taking applications for the 2013 AAUS/OWUSS scientific diving internship. This internship will provide undergraduates with the experience and opportunities necessary for a future in science, diving for research, or scientific diving-related fields. Intern applicants can be students from colleges and universities with an interest in science and diving. The internship will be supported by funding for travel to/from site, room, board, and other internship-related expenses. For more information: https://secure.aaus.org/aausowuss_internship. To apply, visit: http://www.owuscholarship.org/internships.

2013 Internship Host

AAUS is seeking OMs interested in hosting the 2013 AAUS/OWUSS summer intern. Please contact the AAUS office if your organization wishes to participate in this educational opportunity.

UPCOMING EVENTS

Pacific Northwest DSO Meeting

Oregon State University and the Oregon Coast Aquarium will host the Pacific Northwest DSO meeting January 10-11, 2013, with a potential for additional field activities on Saturday, January 12. Itinerary includes morning presentation with discussions and afternoon hands-on workshops. Proposed workshop topics include rescue techniques and training refresher, managing divers and equipment in cold water rescues, and PacNW invasive species: field identification and diver survey techniques. Registration fee is $50 and includes lunches at OSU's Hatfield Marine Science Center and dinner on Thursday night hosted by the Oregon Coast Aquarium. Low-cost bunkhouse style housing is available at Hatfield, and discounted rates are available at a few local hotels. Deadline for registration is December 21. For more info or to RSVP for attendance and/or housing contact Kevin Buch; kevin.buch@oregonstate.edu; 541-737-6893.

International Symposium on Underwater Technol.

The 2013 meeting (UT13) will be held in Tokyo March 5-8, organized by the IEEE OES Japan Chapter, the University of Tokyo's Institute of Industrial Science (IIS), Earthquake Research Institute and Japan Agency for Marine-Earth Science and Technology (JAMSTEC). The symposium will provide a thematic umbrella under which attendees will discuss the problems and potential long-term solutions that concern not only the Pacific Rim countries, but the world in general. As the meeting will be held after two years since the giant earthquake that struck North-Eastern Coast of Japan, there will be a special session for Underwater Technology for Disaster Mitigation and Prevention. Online registration: http://seasat.iis.u-tokyo.ac.jp/UT2013/. For more information, contact the Technical Co-Chairs Prof. Akira Asada at asada@iis.u-tokyo.ac.jp, or Prof. Shinichi Takagawa at takagawa@iis.u-tokyo.ac.jp.

JOB ANNOUCEMENTS

Dive Technician - California Science Center

The Dive Programs Technician (DPT) possesses a current scientific diver certification and will assist the Dive Safety Officer (DSO) developing, implementing, and maintaining the Science Center's Dive Safety and Volunteer Diver training programs. The DPT will assist with the collection

of aquatic organisms including safely trailering, towing, launching and operating a vessel on open ocean and in harbor areas. Additionally, qualified candidates will utilize effective and safe collecting procedures, collecting specimens of marine fish and invertebrates, and transporting them back to the Science Center unharmed. The DPT will be responsible for appearance and operation of all assigned exhibits and support areas. See the full job posting at www.aaus.org/job_board. To apply send cover letter, resume and salary history (a must) to the HR Dept. via fax at 213-744-2673, email to HR@cscmail.org, or mail to the California Science Center Foundation, H. R. Dept, 700 Exposition Park Dr., Los Angeles, CA 90037. No phone calls please.

Senior Diving Officer – Smithsonian Institution

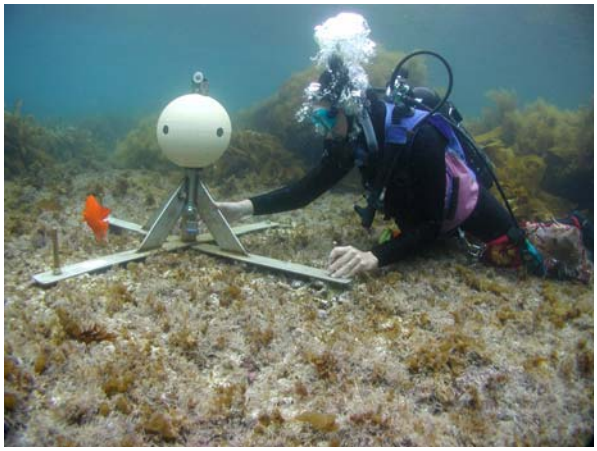
The Smithsonian Institution seeks applications for senior Diving Officer for its Scientific Diving Program. This is a federal position (GS14/15) based in Washington DC, which provides oversight to the Smithsonian's Scientific Diving Program worldwide, including four major field sites (Chesapeake Bay, Florida, Belize, Panama) as well as activities in other locations globally. Applicants should have experience leading a complex scientific diving program with a focus on the natural sciences. The deadline for applications is December 28, 2012. Please visit https://secure.aaus.org/job_board for full description and application.

OM PROGRAM HIGHLIGHT

University of California, Santa Cruz

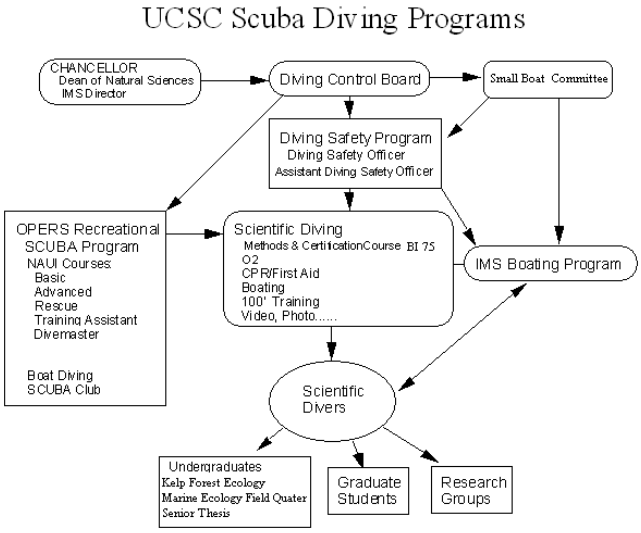
Diving at the University of California at Santa Cruz includes both Scientific and Recreational scuba diving. Our divers include students, staff and faculty. All diving at UCSC is under the direction of the Diving Control Board, a committee of faculty, staff, students who are themselves scientific and recreational divers. UCSC's Diving Safety Program (DSP) exists to facilitate safe diving. The DSP assists divers in meeting UCSC diving regulations as well as ensuring compliance with federal OSHA and AAUS standards for scientific diving. The campus Diving Safety Officer runs the DSP and carries out day to day training, record keeping, and operations. In addition, the DSP serves as a resource center for diving information, equipment, small boats and training classes.

Since its inception in 1972, UCSC has trained 976 scientific divers which include students, staff and faculty. An average year sees 100 science divers performing 3000 dives with a cumulative bottom time of over 2200 hours. This translates into 280 boating days on the water, over 1000 person days on the water and the filling of over 2400 cylinders. UCSC works collaboratively with institutions all over the world which means over 150 LORs are processed each year.



Scientific Diver Training

To become a scientific diver, students must first complete basic, advance and rescue diving certifications, CPR, First Aid, Oxygen Administration and pass written and pool tests. Then they must complete the Scientific Diving Methods and Certification course which is taught twice each year as either a 16 day intensive course or over an entire quarter. It is a two unit methods class offered through Biology. The course consists of 10 lectures, five pool sessions and 16 ocean dives in a variety of marine environments for a total contact time of over 100 hours.



Courses Involving Scientific Diving

Scientific Diving Certification. Prerequisite for course 161/L, *Kelp Forest Ecology,* and all research diving performed under the auspices of UCSC or other academic institutions. *S. Clabuesch*

Marine Ecology Laboratory. Supervised individual research projects in experimental marine biology. Offered in alternate academic years. *M. Carr*

Kelp Forest Ecology Laboratory. Fieldwork using scuba to quantitatively and qualitatively examine the abundance and distribution of organisms in kelp forests, with additional laboratory work. Offered in alternate academic years. *P. Raimondi, M. Carr*

Marine Ecology Field Quarter: Marine Ecology with Laboratory. Total immersion in marine ecology for very motivated students. Students develop a research project during first five weeks on campus and then spend five weeks of immersion in directed research without distraction in isolated locations off campus. Offered in alternate academic years. *P. Raimondi, G. Bernardi*

Recreational Diving

The UCSC Office of Physical Education, Recreation, and Sports (OPERS) offers recreational diving courses including basic, advanced, rescue, divemaster, instructor and a variety of specialty scuba courses. They also sponsor the scuba club. Classes are available to the UCSC community (faculty, staff, students, alumni) only. Also started in 1972, over 4500 divers have received their recreational scuba training through this program with over 20% of these divers going on to become scientific divers.

UCSC/IMS Boating

The UCSC/IMS Scientific Boating Program has a variety of vessels available for researchers to use. To ensure safe operation and proper care all users must be trained and/or checked out by the Diving Safety Program (DSP). Training standards meet those of Scientific Boating Safety Association (SBSA). The DSP also supports Ano Nuevo Island Reserve operations by providing researchers with boat transportation to and from the island.

Recent Publications from UCSC

Cover WA. Species interactions affecting corals and recruitment on a protected, high-latitude reef: herbivory, predation, and competition by fishes, urchins, macroalgae and cyanobacteria. Doctoral dissertation, University of California, Santa Cruz, 2011.

Interactions between species can affect major processes that shape community structure in many systems. Both fishes and urchins are important herbivores on corals reefs, maintaining resilience through their grazing activities and preventing coral-macroalgal phase shifts. Despite their importance, little is known about the relative importance of these different herbivore guilds and of the scale and magnitude of their positive and negative effects on corals. First, I investigated coral recruitment at six backreef sites on Midway Atoll, including two anthropogenically impacted sites with metal debris that have periodic blooms of the benthic cyanobacterium *Hormothamnion enteromorphoides*. Contrary to expectations, coral recruitment was significantly higher at the two cyanobacterial bloom sites than at the four control sites. The proportion of recruits on exposed surfaces was higher at bloom sites than at controls, indicating that cyanobacteria indirectly enhanced recruitment by inhibiting fish grazers that usually remove small corals from exposed surfaces. Next, I conducted a factorial field experiment to quantify the relative effects of herbivorous fishes and urchins (*Echinometra mathaei*) on macroalgal growth and coral recruitment. Fish grazing effectively limited algal biomass, which was >50 times higher in treatments without fishes. Coral recruitment was >2X higher in treatments exposed to fish grazing, indicating that algae inhibit coral recruitment more than do fishes. Algal biomass was negatively correlated with coral recruitment, suggesting that management to increase herbivorous fishes and grazing levels is likely to benefit coral recruitment. Finally, I investigated direct, species-specific effects of urchins on corals. Most fragments of all three coral species

exposed to *E. mathaei* were damaged within days and the damage increased over several weeks to months, often ending with complete removal of all coral tissue and skeleton. Fragments in plots without *E. mathaei*, and all fragments exposed to *H. mammillatus* plots were unaffected. These studies demonstrate a number of positive and negative, direct and indirect effects of herbivores on corals. Negative effects of urchins are lessened by their spatial restrictions, and negative effects of fishes are outweighed by the positive effects of algae removal, clearing space for coral recruits and enhancing the resilience of coral reef communities.

O'Leary J, Potts D, Braga J, McClanahan T. Indirect consequences of fishing: reduction of coralline algae suppresses juvenile coral abundance. Coral Reefs. 2012; 31:547-559 DOI 10.1007/s00338-012-0872-5.

Removing predatory fishes has effects that cascade through ecosystems via interactions between species and functional groups. In Kenyan reef lagoons, fishing induced trophic cascades produce sea urchin-dominated grazing communities that greatly reduce the overall cover of crustose coralline algae (CCA). Certain species of CCA enhance coral recruitment by chemically inducing coral settlement. If sea urchin grazing reduces cover of settlement- inducing CCA, coral recruitment and hence juvenile coral abundance may also decline on fished reefs. To determine whether fishing-induced changes in CCA influence coral recruitment and abundance, we compared (1) CCA taxonomic compositions and (2) taxon-specific associations between CCA and juvenile corals under three fisheries management systems: closed, gear-restricted, and open-access. On fished reefs (gear-restricted and openaccess), abundances of two species of settlement-inducing CCA, Hydrolithon reinboldii and H. onkodes, were half those on closed reefs. On both closed and fished reefs, juveniles of four common coral families (Poritidae, Pocilloporidae, Agariciidae, and Faviidae) were more abundant on Hydrolithon than on any other settlement substrate. Coral densities were positively correlated with Hydrolithon spp. cover and were significantly lower on fished than on closed reefs, suggesting that fishing indirectly reduces coral recruitment or juvenile success over large spatial scales via reduction in settlement-inducing CCA. Therefore, managing reefs for higher cover of settlement-inducing CCA may enhance coral recruitment or juvenile survival and help to maintain the ecological and structural stability of reefs.

Vroom P, Asher J, Braun C, Coccagna E, Vetter O, Cover W, McCully K, Potts D, Marie A, Vanderlip C. Macroalgal (*Boodlea composita*) bloom at Kure and Midway Atolls, Northwestern Hawaiian Islands. Botanica Marina. 2009; 52(4):361-3.

The first recorded macroalgal bloom to occur at Kure and Midway Atolls in the highly protected Northwestern Hawaiian Islands was observed during summer 2008 on shallow water reefs. The native green macroalga *Boodlea composita* formed dense mats centimeters in thickness in select areas and formed decomposing masses on beaches at Kure Atoll. Mild oceanographic conditions during winter 2008 likely weakened lagoonal flushing systems, and when coupled with weeks of low wind and warm sea surface temperatures during the proceeding summer months, physical conditions within the lagoons of each atoll fostered rapid growth of this normally non-blooming alga.

Wong R, Oliver A, Linington R. Development of antibiotic mode of action profile screening for the classification and discovery of natural product antibiotics. Chem Bio, 2012, http://dx.doi.org/10.1016/j.chembiol.2012.09.014

Despite recognition of the looming antibiotic crisis by healthcare professionals, the number of new antibiotics reaching the clinic continues to decline sharply. This study aimed to establish an antibiotic profiling strategy using a panel of clinically relevant bacterial strains to create unique biological fingerprints for all major classes of antibiotics. Antibiotic mode of action profile (BioMAP) screening has been shown to effectively cluster antibiotics by structural class based on these fingerprints. Using this approach, we have accurately predicted the presence of known antibiotics in natural product extracts and have discovered a naphthoquinone-based antibiotic from our marine natural products library that possesses a unique carbon skeleton. We have demonstrated that bioactivity fingerprinting is a successful strategy for profiling antibiotic lead compounds and that Bio-MAP can be applied to the discovery of new natural product antibiotics leads.

NEW PUBLICATIONS

Azzopardi E, Sayer M. Estimation of depth and temperature in 47 models of diving decompression computer. Underwater Technol. 2012; 31(1): 3-12.

Forty seven models of diving computer were subjected to a range of nominal depths (10, 20, 30, 40 and 50m), in freshwater and seawater, in a simulated temperate environment. The depths downloaded from the computers were adjusted for density and compared to the published limits of the EU standard EN13319:2000 for depth-time measurement. The estimated depths for most of the computer models were close to or within the limits for the standard, but were not always near to the accuracies claimed by the manufacturers. Testing was complicated by the manufacturers' lack of specification of the salinity standards used by most dive computers for the conversion of pressure measured to depth displayed. The mean estimated depths tended toward the simulated nominal test depths; maxima/minima depth differences from nominal

were 2.4m/−1.5m and 1.6m/−0.8m for freshwater and seawater tests, respectively. The results from the temperature trials generated a measured range of 5.1°C from nominal values, although the differences in the methods employed either by the computers or the download software to record or display temperature negated standardised comparison. It was concluded that caution should be employed when using displayed and/or recorded depth and temperature data from dive computers in scientific or forensic studies.

Caramanna G, Kekäläinen P, Leinikki J, Maroto-Valer M. Scientific diving techniques in restricted overhead environments. Underwater Technol. 2012; 31(1): 13-19.

Scientific diving is an extremely useful tool for supporting research in environments with restricted access, where remotely operated or autonomous underwater vehicles cannot be used. However, these environments tend to be close to the surface and require the application of advanced diving techniques to ensure that the research is conducted within acceptable safety parameters. The two main techniques discussed are under-ice and cave diving; for each environment the specific hazards are reviewed and methods for mitigating the concomitant risks are detailed. It is concluded that scientific diving operations in these environments can be conducted to acceptable risk levels; however, risk management strategies must outline precisely when and where diving operations are to be prohibited or terminated.

Caramanna G, Malatesta R, Maroto-Valer MM. Scientific diving techniques for the study of flooded sinkholes in Italy. Underwater Technol. 2012; 31(1): 29-41.

The hydrogeology and geomorphology of some flooded sinkholes in central Italy have been studied by means of scientific diving techniques. A first group of three sinkholes is located on travertine deposits around the limestone ridge of the Cornicolani Mounts. One of these, S. Angelo Lake, is flooded by the outcrop of the regional water table. The other two, Regina Lake and Colonnelle Lake, are fed by geothermal springs with high levels of gas and are known as Acque Albule (white waters) because of the presence of cloudy layers of sulphuric water. It was possible to identify the S. Angelo Lake as a sinkhole created by the collapse of the roof of a former flooded cave. The underwater survey and water sampling of the Acque Albule sinkholes confirmed the presence of sulphuric springs emitting acidic water. The last studied sinkhole, Doganella sinkhole, is in the sedimentary cover of the Pontina Plain. It was created almost overnight by a sudden collapse in the unconsolidated sediments, and was then flooded by the local groundwater table. The S. Giovanni Lake can be classified as 'collapse sinkhole', while the Acque Albule are identified as hydrothermal-karst sinkholes. The Doganella sinkhole shows alluvial and pyroclastic deposits in the submerged section, and its genesis is not totally understood yet.

Ha H, Park K. High-resolution comparison of sediment dynamics under different forcing conditions in the bottom boundary layer of a shallow, micro-tidal estuary. J Geophys Res. 2012; 117. doi:10.1029/2012JC007878

Data for high-resolution profiles of current velocity and suspended sediment concentration (SSC) were collected in bottom boundary layer (BBL) of Mobile Bay, Alabama. The data were used to study the vertical and temporal variability in SSC under various forcing conditions of tide, wind and freshwater discharge. During the winter stormy season, the background SSC was low (0.015–0.03 g l^{-1}). An episodic storm-induced erosion/resuspension was responsible for the short-lasting high SSC in BBL. During the spring flooding period, the background SSC was relatively high (0.04–0.07 g l^{-1}) likely due to the large amount of suspended sediment from the fluvial input and bed softening, and the contribution of wind forcing to sediment resuspension was somewhat enhanced by the destratification in BBL. When the freshwater discharge was extremely high (>5000 m^3 s^{-1}), the entire water column in shallow areas of the Bay was influenced by freshwater input. Therefore, the thermohaline anomaly's contribution to the stratification considerably weakened, while the SSC's contribution strengthened. When the freshwater discharge was relatively low (<5000 m^3 s^{-1}), a critical wind stress for sediment erosion (0.08–0.1 Pa) was observed to abruptly increase the SSC. Despite a micro-tidal regime, Mobile Bay exhibited the cyclic erosion and deposition pattern induced by the tidal acceleration and deceleration.

Lang MA. Coral reef research: advances through the use of scuba. Underwater Technol. 2012; 31(1): 21-27.

Coral reefs are, per unit area, the most productive and diverse ecosystems on the planet. Their complexity and, in some places, fragility provide many complications to scientists conducting high quality research in these environments. Scientific diving has been, for the past six decades, a highly cost-effective and productive tool in coral reef research. Using high impact outputs and based mainly on the research supported through the diving programmes of the Smithsonian Institution, this review outlines some major scientific advances that have been made in coral reef research because of the support or use of scuba. The main areas of interest reported here are: algal sexual reproduction on coral reefs, coral spawning, conservation biology, coral diseases and declines, biodiversity, keystone species, biogeography of reef fishes, and DNA barcoding. The review concludes that significant advances in many areas of coral reef research were only achievable through diving-based approaches.

Salm A. Decompression calculations for trimix dives with PC software: variations in the time-to-surface: where do they come from? Underwater Technol. 2012; 31(1): 43-47.

Dive computers for mixed gas diving and PC software for decompression calculations are often considered as 'black boxes' to the diver: they perform part of their function – the calculation of a decompression schedule – but leave the user in a somewhat nebulous state about the relative safety of this schedule. This is because, in reality, the technology, underlying algorithms and utilised constants are not clearly documented, especially if the so-called gradient factors come into play. Gradient factors are sometimes praised as safety knobs for the decompression schedules, or as a unique selling proposition for these black boxes. This paper discusses the impact of gradient factors on the calculation of decompression times, as well as how the different implementations of dive profile data can influence these calculations. With one inert gas in the breathing mixture, the analytical expression for the decompression time is td. However, if there is more than one inert gas present, the decompression time must be calculated numerically. Therefore 480 square dive profiles were analysed in the technical/recreational diving range using one freeware, two commercially available software packages and one private software with numerical methods. There are significant differences in the calculation of the decompression times with trimix gases, depending on the helium percentage. In the present analysis, these differences do not come from variations in the decompression algorithms but rather from different implementations of these numerical methods. Presently, a definitive answer cannot be given about the origin of these variations but the user should be aware that these exist.

Van Rein H, Schoeman D, Brown C, Quinn R, Breen J. Development of low-cost image mosaics of hard-bottom sessile communities using scuba: comparisons of optical media and of proxy measures of community structure. J Mar Bio Assoc UK. 2012; 92: 49-62.

Underwater image-based sampling procedures, using scuba, are compared using imagery collected from a temperate hard-substratum community. The effectiveness of a low-budget, high-resolution image mosaicing technique is assessed by comparing the relative efficiency of data collection, extraction and analysis among sampling procedures. In addition, a manipulative experiment tested whether the sampling procedures could detect the physical removal of 10% of the reef community. Overall, four factors were explored within the data: data collection media (stills and video), cover and community composition estimation techniques (visual cover estimation, frequency of occurrence and point extraction), change detection (pre- and post-impact) and depth (8, 14, 18 and 22 m). Stills imagery sampled the reef community at a higher image resolution than the video imagery, which enabled identification of more species and less-conspicuous benthic categories. Using the visual cover estimation technique, the stills imagery also had the greatest benefit in terms of efficiency and species identification. However, the experimental impact was detected using only the point extraction technique. The recommendations are that: (1) the image mosaicing technique is applied to fixed-station monitoring; (2) the point extraction technique be used for efficient and cost-effective monitoring at coarse taxonomic resolutions; and (3) survey depths remain constant over the duration of hard-substratum community monitoring.

DIVING PHYSIOLOGY PUBLICATIONS

Bernaldo de Quirós Y, González-Díaz O, Møllerløkken A, Brubakk AO, Hjelde A, Saavedra P, Fernández A. Differentiation at autopsy between in vivo gas embolism and putrefaction using gas composition analysis. Int J Legal Med. 2012 Oct 23. [Epub ahead of print]

Gas embolism can arise from different causes (iatrogenic accidents, criminal interventions, or diving related accidents). Gas analyses have been shown to be a valid technique to differentiate between putrefaction gases and gas embolism. In this study, we performed systematic necropsies at different postmortem times in three experimental New Zealand White Rabbits models: control or putrefaction, infused air embolism, and compression/decompression. The purpose of this study was to look for qualitative and quantitative differences among groups and to observe how putrefaction gases mask in vivo gas embolism. We found that the infused air embolism and compression/decompression models had a similar gas composition prior to 27-h postmortem, being typically composed of around 70-80 % of N_2 and 20-30 % of CO_2, although unexpected higher CO_2 concentrations were found in some decompressed animals, putting in question the role of CO_2 in decompression. All these samples were statistically and significantly different from more decomposed samples. Gas composition of samples from more decomposed animals and from the putrefaction model presented hydrogen, which was therefore considered as a putrefaction marker.

Blatteau JE, Barre S, Pascual A, Castagna O, Abraini JH, Risso JJ, Vallee N. Protective effects of fluoxetine on decompression sickness in mice. PLoS One. 2012;7(11):e49069. doi: 10.1371/journal.pone.0049069. Epub 2012 Nov 8.

Massive bubble formation after diving can lead to decompression sickness (DCS) that can result in central nervous system disorders or even death. Bubbles alter the vascular endothelium and activate blood cells and inflammatory pathways, leading to a systemic pathophysiological process that promotes ischemic damage. Fluoxetine, a well-known antidepressant, is

recognized as having anti-inflammatory properties at the systemic level, as well as in the setting of cerebral ischemia. We report a beneficial clinical effect associated with fluoxetine in experimental DCS. 91 mice were subjected to a simulated dive at 90 msw for 45 min before rapid decompression. The experimental group received 50 mg/kg of fluoxetine 18 hours before hyperbaric exposure (n=46) while controls were not treated (n=45). Clinical assessment took place over a period of 30 min after surfacing. At the end, blood samples were collected for blood cells counts and cytokine IL-6 detection. There were significantly fewer manifestations of DCS in the fluoxetine group than in the controls (43.5% vs. 75.5%, respectively; p=0.004). Survivors showed a better and significant neurological recovery with fluoxetine. Platelets and red cells were significantly decreased after decompression in controls but not in the treated mice. Fluoxetine reduced circulating IL-6, a relevant marker of systemic inflammation in DCS. We concluded that fluoxetine decreased the incidence of DCS and improved motor recovery, by limiting inflammation processes.

Eftedal I, Jørgensen A, Røsbjørgen R, Flatberg A, Brubakk AO. Early genetic responses in rat vascular tissue after simulated diving. Physiol Genomics. 2012 Nov 6. [Epub ahead of print]

Diving causes a transient reduction of vascular function, but the mechanisms behind this are largely unknown. The aim of this study was therefore to analyze genetic reactions that may be involved in acute changes of vascular function in divers. Rats were exposed to 709 kPa of hyperbaric air (149 kPa PO_2) for 50 minutes followed by post-dive monitoring of vascular bubble formation and full genome microarray analysis of the aorta from diving rats (n=8) and unexposed controls (n=9). Upregulation of 23 genes was observed one hour after simulated diving. The differential gene expression was characteristic of cellular responses to oxidative stress, with functions of upregulated genes including activation and fine-tuning of stress responsive transcription, cytokine/cytokine receptor signaling, molecular chaperoning and coagulation. By qRT-PCR, increased transcription of neuron-derived orphan receptor-1 (Nr4a3), plasminogen activator inhibitor 1 (Serpine1), cytokine TWEAK receptor Fn14 (Tnfrsf12a), transcription factor class E basic helix-loop-helix protein 40 (Bhlhe40) and adrenomedullin (Adm) was verified. Hypoxia inducible transcription factor HIF1 subunit HIF1-α was stabilized in the aorta one hour after diving, and after four hours there was a five-fold increase in total protein levels of the pro-coagulant plasminogen activator inhibitor 1 (PAI1) in blood plasma from diving rats. The study did not have sufficient power for individual assessment of effects of hyperoxia and decompression-induced bubbles on post-dive gene expression. However, differential gene expression in rats without venous bubbles was similar to that of all the diving rats, indicating that elevated PO_2 instigated the observed genetic reactions.

Gempp E, Louge P. Inner ear decompression sickness in scuba divers: a review of 115 cases. Eur Arch Otorhinolaryngol. 2012 Oct 26. [Epub ahead of print]

Inner ear decompression sickness (IEDCS) in scuba divers is increasingly observed, but epidemiological data are limited to small case series and the pathogenesis remains elusive. We report our experience over a 13-year period. We also thought to demonstrate that the development of this injury is mainly attributed to a mechanism of vascular origin. Diving information, clinical data, presence of circulatory right-to-left shunt (RLS), and laboratory investigations of 115 recreational divers were retrospectively analyzed. A follow-up study at 3 months was possible with the last 50 consecutive cases. IEDCS (99 males, 44±11 years) represented 24% of all the patients treated. The median delay of onset of symptoms after surfacing was 20 min. Violation of decompression procedure was recorded in 3% while repetitive dives were observed in 33%. The median time to hyperbaric treatment was 180 min. Pure vestibular disorders were observed in 76.5%, cochlear deficit in 6% and combination of symptoms in 17.5%. Additional skin and neurological disorders were reported in 15% of cases. In 77%, a large RLS was detected with a preponderant right-sided lateralization of IEDCS (80%, $p<0.001$). Incomplete recovery was found in 68% of the followed patients. Time to recompression did not seem to influence the clinical outcome. IEDCS is a common presentation of decompression sickness following an uneventful scuba dive, but the therapeutic response remains poor. The high prevalence of RLS combined with a right-sided predominance of inner ear dysfunction suggests a preferential mechanism of paradoxical arterial gas emboli through a vascular anatomical selectivity.

Oztürk O, Tek M, Seven H. Temporomandibular disorders in scuba divers - an increased risk during diving certification training. J Craniofac Surg. 2012 Nov 9. [Epub ahead of print]

ABSTRACT: The design of a diving regulator's mouthpiece increases the risk of a temporomandibular disorder (TMD) in scuba divers. The total weight of a diving regulator is reflected directly on the temporomandibular joint, causing articular and periarticular disorders. In the current study, the prevalence of TMD in scuba divers triggered during diving certification training is investigated. We also aimed to determine the factors that lead to TMD during diving training and clarify the observation that there is an increased incidence of TMD in inexperienced divers. The study was held between 2006 and 2011. Ninety-seven divers were referred with the complaint of pain around temporomandibular area. The divers were classified

according to their diving experience. Symptoms and signs of TMD were graded. Fourteen divers were diagnosed with TMD. Temporomandibular disorder was seen more frequently in inexperienced divers than in experienced divers (p=0.0434). The most prevalent symptom was an increased effort for mouthpiece gripping. Temporomandibular joint tenderness and trigger point activation were the mostly seen physical signs. Thirteen divers had an improvement with therapy. The increased effort for stabilizing the mouthpiece is a recognized factor in TMD development. Attention must be paid to an association of scuba diving with TMDs, especially in inexperienced divers having a scuba certification training.

Schellart NA, Vellinga TP, van Dijk FJ, Sterk W. Doppler bubble grades after diving and relevance of body fat. Aviat Space Environ Med. 2012; 83(10): 951-7.

BACKGROUND: From the literature on venous gas embolism (VGE) and decompression sickness (DCS), it remains unclear whether body fat is a predisposing factor for VGE and DCS. Therefore, this study analyses body fat (range 16-44%) in relation to precordial VGE measured by Doppler bubble grades. Also examined is the effect of age (range 34-68 yr), body mass index (BMI; range 17-34 $kg \cdot m^{-2}$), and a model estimate of $VO_{2\,max}$ (maximal oxygen uptake; range 24-54 $ml \cdot kg^{-1} \cdot min^{-1}$). METHODS: Bubble grades were determined in 43 recreational divers after an open sea air dive of 40 min to 20 m. Doppler bubble grade scores were transformed to the logarithm of the number of $bubbles \cdot cm^{-2}$, logB, and the logarithm of the Kissman Integrated Severity Score (KISS) to allow numerical analysis. Statistical analyses were performed with Pearson's regular and partial correlations, and uni- and multivariate linear regressions. RESULTS: For divers in their midlife (and older), the analyses indicate that neither body fat nor BMI stimulate bubble formation, since correlations were nonsignificant. In contrast, age and especially $VO_{2\,max}$ appeared to determine VGE. For these types of dives it was found that logB = -1.1 + 0.02 age - $0.04VO_{2\,max}$. CONCLUSION: Based on these data we conclude that body fat and BMI seem less relevant for diving. We recommend that medical examinations pay more attention to $VO_{2\,max}$ and age, and that international dive institutions come to a consensus regarding $VO_{2\,max}$ criteria.

Schiffer TA, Larsen FJ, Lundberg JO, Weitzberg E, Lindholm P. Effects of dietary inorganic nitrate on static and dynamic breath-holding in humans. Respir Physiol Neurobiol. 2012 Oct 23. pii: S1569-9048(12)00271-6. doi: 10.1016/j.resp.2012.09.008. [Epub ahead of print]

Inorganic nitrate has been shown to reduce oxygen cost during exercise. Since the nitrate-nitrite-NO pathway is facilitated during hypoxia, we investigated the effects of dietary nitrate on oxygen consumption and cardiovascular responses during apnea. These variables were measured in two randomized, double-blind, placebo-controlled, crossover protocols at rest and ergometer exercise in competitive breath-hold divers. Subjects held their breath for predetermined times along with maximum effort apneas after two separate three-day periods with supplementation of potassium nitrate/placebo. In contrast to our hypothesis, nitrate supplementation led to lower arterial oxygen saturation (SaO_2, 77±3%) compared to placebo (80±2%) during static apnea, along with lower end-tidal fraction of oxygen ($F_{ET}O_2$) after 4min of apnea (nitrate 6.9±0.4% vs. placebo 7.6±0.4%). Maximum apnea duration was shorter after nitrate (329±13 s) compared to placebo (344±13 s). During cycle ergometry nitrate had no effect on SaO_2, $F_{ET}O_2$ or maximum apnea duration. The negative effects of inorganic nitrate during static apnea may be explained by an attenuated diving response

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American Academy of Underwater Sciences
101 Bienville Boulevard, Dauphin Island, AL 36528
Tel 251 591 3775 Fax 251-861-7540
aaus@disl.org www.aaus.org

Editor: Heather Fletcher - aaus@disl.org
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