



# E-SLATE

## American Academy of Underwater Sciences (AAUS)

### EDITOR'S NOTE – June 2009

Welcome to the June issue of the E-Slate. The application deadline for AAUS Student Scholarships is June 30. Do not miss the opportunity to have your graduate research funded by AAUS. Also, be sure to check out the upcoming events for scientific meetings and courses.

The E-Slate is a newsletter from and for the scientific dive community. We welcome news, announcements, job positions, new citations, and images with captions of underwater work. Please email submissions to [aaus@disl.org](mailto:aaus@disl.org). Current and past issues of the E-Slate are available at [www.aaus.org](http://www.aaus.org).

### NEWS/ANNOUNCEMENTS

#### AAUS Student Scholarships

AAUS awards two scholarships to graduate students engaged in, or planning to begin, a research project in which diving is or will be used as a principal research tool or studying diving science.

The Kevin Gurr Scholarship awards \$2500 to a Master program student (<http://www.vr3.co.uk>).

The Kathy Johnston Scholarship awards \$2500 to a doctoral student (<http://www.kathyjohnston.com>).

AAUS may also award two additional \$1500 scholarships to the next two proposals that are ranked the highest. If the additional scholarships are awarded, they may be split between the Master and doctoral programs or they may be both awarded within a single program.

Applicants must fulfill the following requirements:

- Be a current member of AAUS (student or full member).
- Be accepted into or enrolled in a Master or doctoral degree program.
- Submit electronically a proposal of 3-5 pages describing the research methods, significance of the research, and a budget (if part of a larger budget, specify how AAUS funds will be spent).
- Agree to write an article for the E-Slate, a news publication of AAUS, describing the proposed research.
- Present the results of their research at an AAUS symposium or other scientific meeting within one year of the project's completion.
- A letter of support from a faculty advisor must be submitted electronically.

Proposal deadline is June 30. Scholarship winners are announced October 1.

E-mail the proposal, budget, and letter of support (all as attachments) to [aaus@disl.org](mailto:aaus@disl.org). The Subject of the e-mail should be "Scholarship." For more information, contact the Scholarship Committee Chair at [aaus@disl.org](mailto:aaus@disl.org).

#### DAN Business Member Offer for AAUS OMs

AAUS is a business member of Divers Alert Network (DAN). Organizational members (OMs) are offered the opportunity to join DAN as an 'Additional Location Business Member.' The annual fee of \$50 payable to DAN will be due this month. DAN will be sending invoices to current business members. If you teach DAN classes and are not a business member, consider joining for substantial discounts on DAN training materials. For more details or to sign up as an Additional Location Business Member contact:

Sam Merrill or Greg Moore  
DAN Business Membership  
1-877-532-6776 x 295

#### AAUS BOD Election

In 2009, AAUS will elect a President Elect, a Secretary, and one of three elected Directors to serve on the AAUS Board of Directors (BOD). The election is open to Full Voting Members (individual and OM Reps) of the Academy in good standing (dues paid, etc.). Balloting closes June 30, 2009. Ballots are accessed via the AAUS website, [www.aaus.org](http://www.aaus.org), by logging into your individual account, highlighting 'Community', selecting 'Polls', and clicking on '2009 AAUS BOD Election.' Candidate biographical sketches and responses to election questions are in the May 2009 issue of the E-Slate (<http://www.aaus.org/mc/page.do?sitePageId=50759&orgId=aaus>).

#### International Workshop Proceedings Available

The Technical University Bergakademie Freiberg, Germany convened the International Workshop on Research in Shallow Marine and Freshwater Systems, May 14-15, 2009. Proceedings were published in hard copy and are available at: [http://www.geo.tu-freiberg.de/scientific\\_diving/workshop2009/index.html](http://www.geo.tu-freiberg.de/scientific_diving/workshop2009/index.html).

#### New Red Alga Discovered In Mediterranean Sea

An international team of researchers led by the University of Girona (UoG) has described a new species of red algae (*Leptofaucheia coralligena*) in the western Mediterranean. *Leptofaucheia coralligena* is a deep-water red alga often found in the western Mediterranean between the end of winter and

autumn. This is the only species of the *Leptofauchea* genus known from the Mediterranean.

The study of the red algae is largely based on the morphology of the female reproductive structure and post-fertilization stages. Classification based on sterile specimens lead to the incorrect taxonomic grouping of *Leptofauchea coralligena*. Until now, *L. coralligena* was thought to belong to the *Rhodymenia* genus, and specifically to the *Rhodymenia ardissoni* species. However, *R. ardissoni* lives close to the surface and reproduces in a different manner. By studying fertile specimens researchers were able to distinguish *L. coralligena* from *R. ardissoni*. DNA sequencing was used to confirm the placement of the new species in the *Leptofauchea* genus. For more information visit:

[www.sciencedaily.com/releases/2009/05/090513091515.htm](http://www.sciencedaily.com/releases/2009/05/090513091515.htm).

## UPCOMING EVENTS

### AMSA 2009 - Marine Connectivity

The Australian Marine Sciences Association Inc. (AMSA) 2009 International Conference will be held in Adelaide, South Australia from July 5-9, 2009 at the Adelaide Convention Centre. The theme of the conference is 'Marine Connectivity.' This conference will provide a forum to discuss the state of the art for investigating marine connectivity, novel approaches and technical advances, and the meaning of connectivity in the oceans and coastal seas. For more information visit: [www.amsaconference.com.au](http://www.amsaconference.com.au).

### Shoals Marine Lab Underwater Archaeology Course

Shoals Marine Laboratory (SML) is offering an Underwater Archaeology course (ARKEO 3002) August 10-17, 2009. This course will be held on Appledore Island, located six miles off the coast of Portsmouth, NH. The course will cover the development of maritime archaeology and the discipline of underwater archaeology. Students will participate in active fieldwork, including underwater exploration. Tuition includes room and board, activity fees, and round trip boat transportation between Portsmouth, NH and Appledore Island. This two-credit course is open to all college undergraduates. If space is available, non-matriculating students may audit with permission of the instructor. Those who wish to scuba dive must be active AAUS scientific divers. Training to become an AAUS scientific diver is also available at SML by participating in our four credit Underwater Research course (BIOSM 3650/ZOOL 730). For those without AAUS diving qualifications, snorkeling is a suitable way to participate. Financial aid is available and students are encouraged to apply. For more information visit: <http://www.sml.cornell.edu>.

### ISOSD 2009

The 2nd International Symposium on Occupational Scientific Diving (ISOSD) of ESPD, held at Tvärminne Zoological Station, University of Helsinki, Finland October 6-8, 2009, is

organized by the Finnish Scientific Diving Steering Association. Symposium organizers welcome oral presentations and posters on all fields of scientific diving and training (science, maritime archaeology, scientific engineering etc.). Special emphasis is on methods, techniques, and instrumentation in actual underwater fieldwork. In addition to scientific presentations, presentations of scientific diving methods, interesting projects etc, are encouraged. Presentations are not required to follow strict scientific guidelines, and may be in the form of image slideshows, video etc. Optional dives at sites of scientific and/or archaeological interest in northern Baltic Sea archipelago, and in a clear water limestone quarry will be offered. Information:

<http://luoto.tvärminne.helsinki.fi/ISOSD2009.html>.

## JOB POSTING

### Perry Institute of Marine Science - Island Manager

The Perry Institute of Marine Science, a research and education organization focused on the tropical and subtropical marine environment is seeking a new resident member of the management team and family at its field station and marine laboratory on Lee Stocking Island in the Exuma Cays of the Bahamas. This position requires a confident, enthusiastic, experienced and responsive leader with a minimum of five years in operations and management. Remote facility experience is a plus. Excellent planning, organizational and effective communication skills, computer literacy, and managerial experience required. College degree required. Working knowledge of scientific-based and/or non-profit organizations (NGO) in an international environment will be essential. Salary range is \$45,000-50,000 depending on experience. Exceptional comprehensive benefits package including health, retirement, housing, travel benefits and more. Responsibilities include, but are not limited to, on-site management of the field station on Lee Stocking Island, under the management of the Executive/Center Director, including direction and supervision of administrative, visitor services, local outreach and facilities staff and operations. A proven track record with project, fiscal, human resources and risk management, budget planning, safety compliance, policy development, logistics and cargo coordination and strategic planning required. Ensures compliance with company policies/procedures and federal laws and regulations. Serves as local liaison with government offices in the Bahamas. Email a cover letter, resume and three professional references to [hneville@perryinstitute.org](mailto:hneville@perryinstitute.org) or fax to 561-741-0193.

The Perry Institute for Marine Science is a 501(c)(3) non-profit organization based in Jupiter, Florida. For more information visit: [www.perryinstitute.org](http://www.perryinstitute.org).

## NEW PUBLICATIONS

**Fitz-Clarke JR. Risk of decompression sickness in extreme human breath-hold diving. Undersea Hyperb Med. 2009; 36(2): 83-91.**

The risk of decompression sickness (DCS) in human breath-hold diving is expected to increase as dives progress deeper until a depth is reached where total lung collapse stops additional nitrogen gas uptake. We assembled a database of all documented human breath-hold dives to 100 m or greater, including both practice and record dives. Between 1976 and 2006 there were 192 such dives confirmed by 24 divers (18 male, 6 female). The deepest dive was to 209 m. There were two drowning fatalities, and two cases of DCS. Depth-time risk estimates for DCS were derived for single breath-hold dives by modifying probabilistic decompression models calibrated with data from short deep no-stop air dives and submarine escape trials using maximum-likelihood estimation. Arterial nitrogen levels during apnea were adjusted for lung compression and decreased cardiac output. Predicted DCS risk is negligible up to about 100 m, beyond which risk increases nonlinearly and reaches a plateau around 5 to 7 percent when total lung collapse occurs beyond 230 m. Results are consistent with data available from deep breath-hold dives.

**Lafère P, Germonpré P, Balestra C. Pulmonary barotrauma in divers during emergency free ascent raining: review of 124 cases. Aviat Space Environ Med. 2009; 80(4): 371-5.**

**INTRODUCTION:** Experience from treating diving accidents indicates that a large proportion of divers suffering from pulmonary barotraumas (PBT) or arterial gas embolism (AGE) were engaged in training dives, specifically emergency free ascent (EFA). We tried to verify this relationship and to calculate, if possible, the risk associated with normal recreational dives, training dives, and EFA training dives. **METHODS:** All diving accidents treated at the Centre for Hyperbaric Oxygen Therapy (Brussels, Belgium) from January 1995 until October 2005 were reviewed. Data on the average number of dives performed and the proportion of in-water skills training dives were obtained from the major Belgian dive associations. **RESULTS:** A total of 124 divers were treated, of whom 34 (27.4%) were diagnosed with PBT. Of those, 20 divers (58.8%) had symptoms of AGE. In 16 of those, EFA training exercise was deemed responsible for the injury. The association between EFA training and PBT proved to be very significant, with an odds ratio of 11.33 (95% confidence interval: 2.186 to 58.758). It was possible to calculate that a training dive (0.456 to 1.36/10,000) carries a 100 to 400 times higher risk, and an ascent training dive (1.82 to 5.46/10,000 dives) a 500 to 1500 times higher risk for PBT than a non-training dive (0.0041 to 0.0043/10,000 dives). **DISCUSSION:** This study

confirms a significant association between EFA training dives and the occurrence of PBT.

**Lairez O, Cournot M, Minville V, Roncalli J, Austruy J, Elbaz M, Galinier M, Carrié D. Risk of neurological decompression sickness in the diver with a right-to-left shunt: literature review and meta-analysis. Clin J Sport Med. 2009; 19(3): 231-5.**

**OBJECTIVE:** Literature review and meta-analysis to review the evidence of relationship between the presence of right-to-left shunts (RLSs) and the occurrence of neurological decompression sickness (DCS) in divers. **DATA SOURCES:** MEDLINE, Google Scholar, and Health Technology Assessment databases. **STUDY SELECTION:** Five case-control studies in which the prevalence of a RLS in a group of divers with neurological DCS was compared with that of a group of divers with no history of DCS, 3 cross-transversal studies in which the prevalence of RLS was measured in divers with neurological DCS, and 4 cross-transversal studies in which the prevalence of RLS was measured in divers with no history of DCS were reviewed. **DATA EXTRACTION:** Only case-control studies were retained for meta-analysis. **DATA SYNTHESIS:** This meta-analysis gathers 5 studies and 654 divers. The combined odds ratio of neurological DCS in divers with RLS was 4.23 (3.05-5.87). The meta-analysis including only large RLS found a combined odds ratio of 6.49 (4.34-9.71). **CONCLUSIONS:** Because of a low incidence of neurological DCS, increase in absolute risk of neurological DCS due to RLS is probably small. Thus, in recreational diving, the systematic screening of RLS seems unnecessary. In professional divers, because of a chronic exposition and unknown consequences of cerebral asymptomatic lesions, these results raise again the benefit of the transcranial Doppler in the screening and quantification of the RLS, independently of their location.

**Mills VS, Berkenbuscha K. Seagrass (*Zostera muelleri*) patch size and spatial location influence infaunal macroinvertebrate assemblages. Estuar Coastal Shelf Sci. 2009; 81(1): 123-9**

Seagrass landscapes are coastal environments that support diverse and abundant faunal communities. This study investigated infaunal assemblage patterns in fragmented and continuous *Zostera muelleri* habitat in southeastern New Zealand. Intertidal macroinvertebrate assemblages were examined in fragmented seagrass habitat (containing discrete patches varying in size from 1 to 200 m<sup>2</sup>) and continuous meadows (>1000 m<sup>2</sup>), in a small and a large tidal inlet. Community indices differed between seagrass habitat types and the total number of taxa was significantly lower at fragmented seagrass sites in one of the inlets. The total number of individuals and diversity were significantly different between fragmented and continuous seagrass habitat in both inlets, but diversity values showed inconsistent patterns between inlets. Multivariate analysis

confirmed that different seagrass habitat types support distinct macrofaunal assemblages in each inlet and position on the shore was identified as the single most important variable explaining dissimilarities in assemblage compositions. These findings confirm the influence of seagrass habitat size on infaunal assemblages and also highlight the importance of spatial position of seagrass habitat in intertidal areas.

**Prediletto R, Fornai E, Catapano G, Carli C, Garbella E, Passera M, Cialoni D, Bedini R, L'Abbate A. Time course of carbon monoxide transfer factor after breath-hold diving. *Undersea Hyperb Med.* 2009; 36(2): 93-101.**

Breath-hold divers may experience haemoptysis during diving. Central pooling of blood as well as compression of pulmonary gas content can damage the integrity of the blood-gas barrier, resulting in alveolar hemorrhage. The single-breath carbon monoxide test (DL,CO) was used to investigate the blood-gas barrier following diving. The study population consisted of 30 divers recruited from a training course. DL,CO levels were measured before diving and at 2, 10 and 25 min after the last of a series of four dives to depths of 10, 15, 20 and 30 m. When compared to pre-diving values, DL,CO values increased significantly at 2 min following diving in all subjects except one. Thereafter values progressively decreased toward baseline at 10 and 25 min in all subjects but one, while in four divers DL,CO values decreased below baseline. The early but transient increase in DL,CO levels shortly after diving supports the persistence of capillary pooling of red blood cells following emersion. Persistence at 25 min of high DL,CO values in one subject could be attributed by lung CT to extravasation of blood into the alveoli. Early or late DL,CO values >10% below baseline values suggest the presence of pulmonary edema. The relatively high prevalence of DL,CO alterations found suggests caution on the safety of breath-hold diving activities.

**Sureda A, Ferrer MD, Batle JM, Tauler P, Tur JA, Pons A. Scuba diving increases erythrocyte and plasma antioxidant defenses and spares NO without oxidative damage. *Med Sci Sports Exerc.* 2009; 41(6): 1271-6.**

**PURPOSE:** The aim of the present work was to study the effects of a single scuba diving immersion to high depth on erythrocyte and plasma antioxidant defenses, on erythrocyte cellular damage, and on nitric oxide (NO) production. **METHODS:** Seven male pre-professional divers performed an immersion at a depth of 40 m for a total time of 25 min. Blood samples were obtained before the diving session after overnight fasting, immediately after diving, and 3 h after the diving session was finished. Erythrocytes and plasma fractions were purified. **RESULTS:** No significant differences were found in circulating erythrocytes, bilirubin, and hemoglobin concentration attributed to diving. Hematocrit levels were reduced after diving because of the reduction of erythrocyte

size that was maintained after 3 h of recovery at the surface. Leukocyte counts significantly increased at recovery (38±4%). In erythrocytes, glutathione peroxidase activity significantly increased (18±4%) at recovery. A rise in plasma catalase activity (38±6%) immediately occurred after diving, returning to basal values after recovery. Plasma superoxide dismutase activity significantly increased (58±7%) during recovery. Markers of oxidative damage in both erythrocytes and plasma such as malondialdehyde and protein carbonyl derivatives remained unchanged after diving. Nitrite levels significantly rose in plasma and erythrocytes (85±8% and 52±6%, respectively) at recovery. **CONCLUSION:** Scuba diving session induced an antioxidant response in plasma and erythrocytes without the appearance of cellular damage and an increase in NO, which can be related with its vasodilator role.

**Tanner JE, Hughes TP, Connell JH. Community-level density dependence: an example from a shallow coral assemblage. *Ecol.* 2009; 90(2): 506-16.**

While density dependence is a popular topic of research in population ecology, it has received much less attention at the community level. Using 27 years of data from Heron Island, on Australia's Great Barrier Reef, we develop a matrix model of coral community dynamics that shows that community-level density dependence does occur and that it is fairly common, being found in 38% of the model parameters for which it was tested. In particular, colonization of free space (through either recruitment or growth of existing colonies) was nearly always density dependent. There were no consistent patterns in the results for mortality, persistence, or species interactions. Most transitions were found to be dependent on the cover of the incoming species group, with only a few dependent on that of the outgoing species group. In addition, few of the transitions representing species interactions were dependent on the amount of free space present, suggesting that the cover of other species does not influence encounters. When these results were combined into a model of community dynamics, it was found that density dependence resulted in a moderate increase in coral cover, which was spread over most species groups. The dynamics of the density-dependent assemblage were also a lot noisier than those of an assemblage without density dependence. Sensitivity analysis indicated that it was density dependence in the colonization probabilities, particularly of encrusting acroporids, bushy Acropora and staghorn Acropora, which had the main influence on the model, although persistence of free space was also important. Transitions representing mortality were only of minor importance, and those representing species interactions were of no importance.

**Toklu AS, Cimsit M. Sponge divers of the Aegean and medical consequences of risky compressed-air dive profiles. *Aviat Space Environ Med.* 2009; 80(4): 414-7.**

Historically, Turkey once had a substantial number of professional sponge divers, a population known for a relatively high incidence of diving-related conditions such as decompression sickness (DCS) and dysbaric osteonecrosis (DON). Sponge diving ended in the mid-1980s when nearly all of the sponges in the Aegean and Mediterranean Seas contracted a bacterial disease and the occupation became unprofitable. We reviewed the records of Turkish sponge divers for information on their level of knowledge, diving equipment, dive profiles, and occupational health problems. Information was collected by: 1) interviewing former sponge divers near Bodrum, where most of them had settled; 2) reviewing the relevant literature; and 3) examining the medical records of sponge divers who underwent recompression treatment. These divers used three types of surface-supplied equipment, including hard helmets, Fernez apparatus, and hookahs; the latter were preferred because they allowed divers the greatest freedom of movement while harvesting sponges underwater. These divers used profiles that we now know involved a high risk for DCS and DON. We were able to access the records of 58 divers who had received recompression treatment. All of the cases involved severe DCS and delays from dive to recompression that averaged 72 h. Complete resolution of symptoms occurred in only 11 cases (19%). Thus, we were able to document the several factors that contributed to the risks in this occupational group, including unsafe dive profiles, resistance to seeking treatment, long delays before recompression, and the fact that recompression treatment used air rather than oxygen.

**Vann RD, Denoble PJ, Howle LE, Weber PW, Freiburger JJ, Pieper CF. Resolution and severity in decompression illness. *Aviat Space Environ Med.* 2009; 80(5): 466-71.**

We review the terminology of decompression illness (DCI), investigations of residual symptoms of decompression sickness (DCS), and application of survival analysis for investigating DCI severity and resolution. The Type 1 and Type 2 DCS classifications were introduced in 1960 for compressed air workers and adapted for diving and altitude exposure with modifications based on clinical judgment concerning severity and therapy. In practice, these proved ambiguous, leading to recommendations that manifestations, not cases, be classified. A subsequent approach assigned individual scores to manifestations and correlated total case scores with the presence of residual symptoms after therapy. The next step used logistic regression to find the statistical association of manifestations to residual symptoms at a single point in time. Survival analysis, a common statistical method in clinical trials and longitudinal epidemiological studies, is a logical extension of logistic regression. The method applies to a continuum of resolution times, allows for time varying information, can manage cases lost to follow-up (censored), and has potential for investigating questions such as optimal therapy and DCI severity. There are operational

implications as well. Appropriate definitions of mild and serious manifestations are essential for computing probabilistic decompression procedures where severity determines the DCS probability that is acceptable. Application of survival analysis to DCI data would require more specific case information than is commonly recorded.

**Vroom P, Timmers M. Spatial and temporal comparison of algal biodiversity and benthic cover at Gardner Pinnacles, Northwestern Hawai'ian Islands. *J Phycology.* 2009; 45: 337-47.**

Papahānaumokuākea Marine National Monument in the Northwestern Hawai'ian Islands is the second largest marine protected area in the world, providing an opportunity for scientists to understand natural ecosystem fluctuations in subtropical marine communities with little anthropogenic impact. Gardner Pinnacles is composed of two emergent basaltic rocks and has the smallest land area of any island in the Northwestern Hawai'ian Island chain but has among the largest submerged reef area. Gardner Pinnacles is also among the least anthropogenically impacted island in the Hawai'ian Archipelago, although a thriving lobster and bottomfish industry existed in the area for many years. This study assesses nearshore algal biodiversity and percent cover at Gardner Pinnacles to examine interannual differences in community dynamics and places them in an ecosystem context by also examining associated invertebrate and fish communities. Biodiversity surveys increased the number of known eukaryotic algal species occurring in marine environments immediately adjacent to the emergent portion of Gardner Pinnacles from 31 to 77. Algal percent cover, specifically populations of the green alga *Microdictyon setchellianum* M. Howe, varied dramatically between sampling years, possibly in response to seasonal differences. Towed-diver surveys revealed that macroalgae covered >90% of the substrate during the 2003 sampling period but returned to 2000 levels (1%–35% cover) by 2004 without any detectable damage to other reef organisms. Fish communities remained statistically similar between sampling years, and percent cover of live coral around the island did not exceed 7%.

The mission of the American Academy of Underwater Sciences is to facilitate the development of safe and productive scientific divers through education, research, advocacy, and the advancement of standards for scientific diving practices, certifications, & operations.

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