



# E-SLATE

## American Academy of Underwater Sciences (AAUS)

### EDITORIAL NOTE – January 2013

Welcome to the January E-Slate. Happy New Year! We would like to recognize all of the efforts by Neal Pollock, Chair of the Publications Committee since 2007, to produce quality publications for AAUS. Neal began the E-Slate and presided over its editorial board and edited or co-edited a number of symposium proceedings beginning in 2006. We will greatly miss his tireless dedication when he rotates off the Board of Directors this month.

In this issue we call for 2013 Conrad Limbaugh Nominations and highlight another organizational member. 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. There is a new website option to be notified when new topics are posted. We welcome news, announcements, job postings, and images of underwater work at [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

#### 2013 Conrad Limbaugh Award Nominations

Nominations are now open for the 2013 Conrad Limbaugh Memorial Award for Scientific Diving Leadership. This award is presented annually to an individual who has made a significant contribution in diving safety and diving leadership on behalf of the scientific diving community. It is open to any past or present member of AAUS. Nominations are sought from the AAUS general membership, and selected candidates are voted for by the AAUS general membership. Current BOD members are not eligible during their term of office.

Conrad Limbaugh was an underwater naturalist and chief diving officer for of Scripps Institute of Oceanography, where he directed the diving program. He died in a scuba diving accident in the Mediterranean on March 20, 1960. Limbaugh graduated from Whittier College in 1948 and did graduate work at the University of California at Los Angeles before going to Scripps Institution in 1950. He was largely responsible for developing the diver-training program at Scripps, as well as many research techniques used by marine scientist.

Please submit the names and contact information for nominees, along with a one-paragraph justification, to John Heine, AAUS Awards Committee, by email to: [jheine@ucsd.edu](mailto:jheine@ucsd.edu) Nominations close March 31, 2013.

#### Website Update

Members can now opt to be notified via email when new topics are posted to the online forum. You can find it in your member profile just above the Member Qualification section. Please login and select this option to become an active part of the online conversation!

#### AAUS Statistics Analysis Published

A panel of four current or former AAUS board members reported on the incidence of decompression illness (DCI) in AAUS scientific diving in the peer-reviewed literature (*Dardeau MR, Pollock NW, McDonald CM, Lang MA. The incidence rate of decompression illness in 10 years of scientific diving. Diving Hyperb Med. 2012; 42[4]: 195-200*). Of the 95 incidents and 1,019,159 dives reported to AAUS between 1998 and 2007, a total of 33 cases were determined to involve decompression illness. The incidence of DCI was 0.324/10,000 person-dives, substantially lower than the rates of 0.9-35.3/10,000 published for recreational, instructional, commercial or military diving. The entire paper is available at [www.aaus.org](http://www.aaus.org).

#### AAUS Member Statistics Submission

DSOs! It is almost time for submission of your organizational member (OM) 2012 scientific diving statistics to the AAUS database. Please begin compiling these numbers now! Even if your OM is using the web based dive log system, you must still print out a summary report, review it for accuracy and submit it to the website below. OMs admitted in 2012 are not required to submit stats for 2012 but if you have them for the full year and would like to submit contact Cheryl Thacker ([cthacker@ehs.ufl.edu](mailto:cthacker@ehs.ufl.edu)) or Mike Dardeau ([mdardeau@disl.org](mailto:mdardeau@disl.org)) to set up a log in. Forms for your 2012 summary submissions will be available after January 01 at [http://stats.diveaaus.org/User\\_Login.asp](http://stats.diveaaus.org/User_Login.asp). Statistics are considered late as of April 01. The statistics committee will work with OMs to overcome any technical issues but if the submitted materials are not complete by July 01, the lapse will be turned over to the Standards Committee for action. A link to the site and data collection criteria are available at [http://aaus.org/statistics\\_committee](http://aaus.org/statistics_committee).

### 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 visit: [https://secure.aaus.org/aausowuss\\_internship](https://secure.aaus.org/aausowuss_internship).

To apply, visit: <http://www.owuscholarship.org/internships>.

### 2013 DAN Research Internship

The DAN Research Internship Program provides experiences to help young people develop their professional capabilities and consider careers in medicine, diving or dive-related fields. Internships typically run for three to four months, usually commencing in the third week of May. DAN strives to make the intern's experience an enriching one by matching their skills and interests with appropriate mentors. Initial orientation is usually provided at DAN headquarters in Durham, NC, but interns may be placed at different locations to assist on a range of field, laboratory or epidemiological research studies. The program may qualify for academic credit from an intern's home institution. Qualities for good DAN research interns include enthusiasm, strong communication skills, initiative, integrity, energy, intelligence, computer literacy and an interest in science and research. While diving may not be required for a given placement, an established dedication to diving is an important prerequisite. Competitive applicants are likely to be upper level undergraduates or recently graduated students with an educational track in a science field. The application deadline is January 15. Visit: <http://www.diversalernetnetwork.org/research/intern>.

### 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

### Man in the Sea Museum 2013 Oyster Bash

*Benefiting the Sealab-1 Restoration Project*

On Saturday, January 26, 2013 the Man in the Sea Museum will be holding an Oyster Bash at The Dive Lab in Panama City Beach, Florida. The Man in the Sea Museum Oyster Bash serves as a fundraiser for the Sealab-1 Restoration Project. The Man in the Sea Museum needs to raise \$250,000 to restore the original Sealab-1 underwater habitat as well as build a suitable structure to house and display it.

Tickets and more information are available at the Man in the Sea Museum or [www.maninthesea.org](http://www.maninthesea.org).

### 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. Register: <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](mailto:asada@iis.u-tokyo.ac.jp), or Prof. Shinichi Takagawa at [takagawa@iis.u-tokyo.ac.jp](mailto:takagawa@iis.u-tokyo.ac.jp).

## JOB ANNOUNCEMENTS

### DAN Research Staff Position

DAN Research is hiring staff to support ongoing and new research projects in diving physiology, medicine and safety. Key research techniques include ultrasonic assessment of decompression-induced bubbles, cardiovascular and pulmonary assessment, electronic data capture and epidemiology. An established interest in diving and human science is necessary. Strong communication (both written and oral) and organizational skills are critical to success. Hiring is possible for post-baccalaureate (*Research Associate I*) or post-master (*Research Associate II*) levels. Contact Dr. Neal Pollock ([neal.pollock@duke.edu](mailto:neal.pollock@duke.edu); 919-684-2948) for more information.

### Dive Safety Officer

*Texas A&M Corpus Christi*

The dive safety officer (DSO) will serve as working diver, lead diver, dive supervisor, and/or mission coordinator during air, mixed gas, decompression, and/or saturation research diving operations involving a variety of diving technologies as appropriate for the organization. The DSO will communicate with scientists, academic administrators, mission team members, vendors and the general public, establish and maintain various record keeping systems and provide oversight of technical programs and administrative activities of dive lockers, ancillary equipment, and facilities. The DSO will also coordinate and manage facilities, equipment, supplies, and related resources in compliance with health and safety regulations to maintain a safe working environment. The DSO will instruct and train staff, students, scientists and other personnel in diving procedures, equipment use and equipment maintenance appropriately for the trainee's qualifications and professional needs. See the full job posting and application instructions at [www.aaus.org/job\\_board](http://www.aaus.org/job_board).

## Dive Technician

### California Science Center

The Dive Programs Technician 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 Dive Programs Technician 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 Dive Programs Technician 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](http://www.aaus.org/job_board). To apply, send cover letter, resume and salary history to the HR Dept. (213-744-2673 fax or [HR@cscmail.org](mailto:HR@cscmail.org) email), or mail to the California Science Center Foundation, HR Dept, 700 Exposition Park Dr., Los Angeles, CA 90037. No phone calls please.

## OM PROGRAM HIGHLIGHT

### California Academy of Sciences

Founded in 1853, the California Academy of Sciences is the oldest research institution west of the Mississippi River. The Academy has utilized diving for scientific research since the inception of scuba in the early 1950s.



The mission of the dive program is to serve the Academy's aquarium, research, and operations by facilitating the safest level of diving practices. Last year, 68 Academy divers made a total of 2,179 safe dives, totaling 1,500 hours underwater.

#### *Volunteer Diving*

The Academy gives around 700 dive shows per year. Averaging 180+ guests per show, our ocean conservation message reaches an estimated 150,000 people per year. Volunteers are in charge of keeping iconic exhibits clean. Our squad of 50+ volunteers continues to grow and develop. Academy volunteer divers made over 1,000 in-house dives that added up to over 4,000 volunteer hours.

#### *Husbandry Diving*

Husbandry divers maintain the health of the animals and do maintenance in the exhibits as required.



#### *Exploration Diving*

The Twilight Zone Project is an exploratory project designed to characterize the life between 200-500 feet. Dive program staff, academy researchers, and aquarium husbandry staff will work collaboratively to safely acquire life from the mesophotic zone for study and display. The Academy has also been involved with mapping and sampling the diversity of life in unexplored caves systems in northern California.

#### *Research Diving*

The Academy research divers make annual trips around the world collecting various organisms for the Academy's extensive collections. We conducted over 1,100 dives in the field last year.



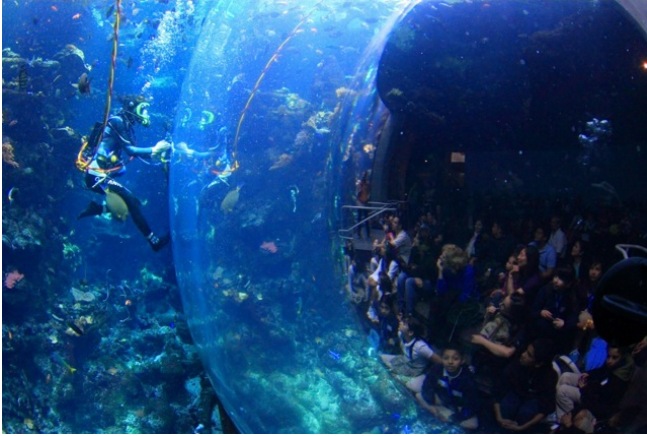
#### *Training*

Academy divers participate in various high-level training programs both in-house and in the field. Our training programs range from Aquarium and Scientific Diver training through Technical and Instructor levels.



### Maintenance

The dive program services and maintains all of the gear that we use from regulators to BC's to full face masks. Each piece of gear is inspected on six-month intervals and serviced every year in-house.



### Recent Publications from California Academy of Science

**DiBattista J, Waldrop E, Bowen B, Schultz J, Gaither M, Pyle R, Rocha L. Twisted sister species of pygmy angelfishes: discordance between taxonomy, coloration, and phylogenetics. Coral Reefs. 2012; 31: 839-51; DOI 10.1007/s00338-012-0907-y.**

The delineation of reef fish species by coloration is problematic, particularly for the pygmy angelfishes (genus *Centropyge*), whose vivid colors are sometimes the only characters available for taxonomic classification. The Lemonpeel Angelfish (*Centropyge flavissima*) has Pacific and Indian Ocean forms separated by approximately 3,000 km and slight differences in coloration. These disjunct populations hybridize with Eibl's Angelfish (*Centropyge eibli*) in the eastern Indian Ocean and the Pearl-Scaled Angelfish (*Centropyge vrolikii*) in the western Pacific. To resolve the evolutionary history of these species and color morphs, we employed mitochondrial DNA (mtDNA) cytochrome b and three nuclear introns (TMO, RAG2, and S7). Phylogenetic analyses reveal three deep mtDNA lineages ( $d = 7.0\text{--}8.3\%$ ) that conform not to species designation or color morph but to geographic region: (1) most Pacific *C. flavissima* plus *C. vrolikii*, (2) *C. flavissima* from the Society Islands in French Polynesia, and (3) Indian Ocean *C. flavissima* plus *C. eibli*. In contrast, the nuclear introns each show a cluster of closely related alleles, with frequency differences between the three geographic groups. Hence, the mtDNA phylogeny reveals a period of isolation (ca. 3.5–4.2 million years) typical of congeneric species, whereas the within-lineage mtDNA UST values and the nuclear DNA data reveal recent or ongoing gene flow between species. We conclude that an ancient divergence of *C. flavissima*, recorded in the non-recombining mtDNA, was subsequently swamped by

introgression and hybridization in two of the three regions, with only the Society Islands retaining the original *C. flavissima* haplotypes among our sample locations. Alternatively, the yellow color pattern of *C. flavissima* may have appeared independently in the central Pacific Ocean and eastern Indian Ocean. Regardless of how the pattern arose, *C. flavissima* seems to be retaining species identity where it interbreeds with *C. vrolikii* and *C. eibli*, and sexual or natural selection may help to maintain color differences despite apparent gene flow.

**DiBattista J, Rocha L, Craig M, Feldheim K, Bowen B. Phylogeny of two closely related Indo-Pacific butterfly fish reveal divergent evolutionary histories and discordant results from mtDNA and microsatellites. J Heredity. 2012; 103(5): 617-29.**

Marine biogeographic barriers can have unpredictable consequences, even among closely related species. To resolve phylogeographic patterns for Indo-Pacific reef fauna, we conducted range-wide surveys of sister species, the scrawled butterflyfish (*Chaetodon meyeri*;  $N = 134$ ) and the ornate butterflyfish (*Chaetodon ornatissimus*;  $N = 296$ ), using mitochondrial DNA cytochrome b sequences and 10 microsatellite loci. The former is distributed primarily in the Indian Ocean but also extends to the Line Islands in the Central Pacific, whereas the latter is distributed primarily in the Central-West Pacific (including Hawaii and French Polynesia) but extends to the eastern margin of the Indian Ocean. Analyses of molecular variance and Bayesian STRUCTURE results revealed 1 range-wide group for *C. meyeri* and 3 groups for *C. ornatissimus*: 1) eastern Indian Ocean and western Pacific, 2) Central Pacific, and 3) Hawaii. Estimates of the last population expansion were much more recent for *C. meyeri* (61,500 to 95,000 years) versus *C. ornatissimus* (184,700 to 286,300 years). Despite similarities in ecology, morphology, life history, and a broadly overlapping distribution, these sister species have divergent patterns of dispersal and corresponding evolutionary history. The mtDNA and microsatellite markers did not provide concordant results within 1 of our study species (*C. meyeri*), or in 7 out of 12 other cases of marine fishes in the published literature. This discordance renews caution in relying on one or a few markers for reconstructing historical demography.

**Gaither M, Toonen R, Bowen B. Coming out of the starting blocks: extended lag time rearranges genetic diversity in introduced marine fishes of Hawai'i. Proc R Soc B. Epub 8 August 2012. doi: 10.1098/rspb.2012.1481**  
Biological invasions with known histories are rare, especially in the sea, and empirical studies of the genetic consequences are even rarer. Fifty-five years ago, the state of Hawai'i began a remarkable, if unintentional, 'experiment' with the introduction of three reef fishes, *Lutjanus fulvus*, *Cephalopholis argus* and *Lutjanus*

*kasmira*. All have since expanded from the initial introduction of 2204 to 3163 individuals; however, historical records show that initially *L. fulvus* remained scarce, *C. argus* had modest population expansion and *L. kasmira* experienced rapid population growth. The consequences of differential population growth rates are apparent in F-statistics: Hawaiian *L. fulvus* demonstrate strong and significant haplotype frequency shifts from the founder location (FST  $\frac{1}{4}$  0.449), *C. argus* shows low but significant differentiation (FST  $\frac{1}{4}$  0.066) and *L. kasmira* is nearly identical to the founder location (FST  $\frac{1}{4}$  0.008). All three species had higher mtDNA diversity in the introduced range, which can be explained by multiple sources for *L. fulvus* and *L. kasmira*, but not for *C. argus*. We conclude that lag time before population expansion, in conjunction with genetic drift, has defined the genetic architecture of these three species in the introduced range.

**Ludt W, Bernal M, Bowen B, Rocha L. Living in the past: phylogeography and population histories of Indo-Pacific wrasses (Genus *Halichoeres*) in shallow lagoons versus outer reefs. *Slopes*. PLoS ONE 2012; 7(6): e38042. doi:10.1371/journal.pone.0038042.**

Sea level fluctuations during glacial cycles affect the distribution of shallow marine biota, exposing the continental shelf on a global scale, and displacing coral reef habitat to steep slopes on oceanic islands. In these circumstances we expect that species inhabiting lagoons should show shallow genetic architecture relative to species inhabiting more stable outer reefs. Here we test this expectation on an ocean-basin scale with four wrasses (genus *Halichoeres*): *H. claudia* (N = 194, with ocean-wide distribution) and *H. ornatisimus* (N = 346, a Hawaiian endemic) inhabit seaward reef slopes, whereas *H. trimaculatus* (N = 239) and *H. margaritaceus* (N = 118) inhabit lagoons and shallow habitats throughout the Pacific. Two mitochondrial markers (cytochrome oxidase I and control region) were sequenced to resolve population structure and history of each species. Haplotype and nucleotide diversity were similar among all four species. The outer reef species showed significantly less population structure, consistent with longer pelagic larval durations. Mismatch distributions and significant negative Fu's F values indicate Pleistocene population expansion for all species, and (contrary to expectations) shallower histories in the outer slope species. We conclude that lagoonal wrasses may persist through glacial habitat disruptions, but are restricted to refugia during lower sea level stands. In contrast, outer reef slope species have homogeneous and well-connected populations through their entire ranges regardless of sea level fluctuations. These findings contradict the hypothesis that shallow species are less genetically diverse as a consequence of glacial cycles.

**McCosker J, Lea R. White shark attacks upon humans in California and Oregon, 1993–2003. *Proc Calif Acad Sci*. 2012; 57(17): 479-501.**

We report on 20 confirmed and five purported but unreliable incidents of unprovoked attacks by white sharks on humans in California and Oregon between 1993 and 2003. All attacks involved white sharks (*Carcharodon carcharias*). The discussion, map, and tables from McCosker and Lea's (1996) report are updated. The majority of attacks occurred at or near the surface, near shore, and often in the vicinity of pinniped colonies and/or river mouths and harbors. Attacks have now occurred during all months, and on surfers, breathhold and scuba divers, swimmers, hookah divers, kayakers, and, for the first time, on bodyboarders, a windsurfer, and a scuba diver using an electric propulsion device. Typical attack scenarios suggest that an adult *C. carcharias* mistakes its victim for a pinniped, its normal prey. Shark attacks were fewer during the extreme 1997–1998 ENSO (El Niño/Southern Oscillation) oceanographic warming event. The defensive activity of humans after being attacked and its effect are discussed. We also comment on recent legislation concerning white shark protection and disallowing the attraction of white sharks by chumming.

**McCosker J, Allen G. Description of a new Snake Eel (Pisces: Ophichthidae: Myrichthys) from the Philippines. *Int. J of Ichthy*. 2012; 18(1): 35-40.**

*Myrichthys paleracio* new species is described from two specimens collected in shallow-water coral reefs from the Verde Passage, southern Luzon Island, Philippines. It differs from all known *Myrichthys* in its vivid brown-and-white coloration, its body elongation (body depth 43 times in total length) and its mean vertebral formula (3/77.5/183). A key to the species of *Myrichthys* is provided.

## CURRENT PUBLICATIONS

**Allgeier J, Yeager L, Layman C. Consumers regulate nutrient limitation regimes and primary production in seagrass ecosystems. *Ecol*. <http://dx.doi.org/10.1890/12-1122.1>.**

Consumer mediated nutrient supply is increasingly recognized as an important functional process in many ecosystems. Yet, experimentation at relevant spatial and temporal scales is needed to fully integrate this bottom-up pathway into ecosystem models. Artificial reefs provide a unique approach to explore the importance of consumer nutrient supply for ecosystem function in coastal marine environments. We used bioenergetics models to estimate community-level nutrient supply by fishes, and relevant measures of primary production, to test the hypothesis that consumers, via excretion of nutrients, can enhance primary production and alter nutrient limitation regimes for two

dominant primary producer groups (seagrass and benthic microalgae) around artificial reefs. Both producer groups demonstrated marked increases in production, as well as shifts in nutrient limitation regimes, with increased fish-derived nutrient supply. Individuals from the two dominant functional feeding groups, herbivores and mesopredators, supplied nutrients at divergent rates and ratios from one another, underscoring the importance of community structure for nutrient supply to primary producers. Our findings demonstrate consumers, through an underappreciated bottom-up mechanism in marine environments, can alter nutrient limitation regimes and primary production, thereby fundamentally affecting the way these ecosystems function.

**Bianchi C, Parravicini V, Montefalcone M, Rovere A, Morri C. The challenge of managing marine biodiversity: a practical toolkit for a cartographic, territorial approach. Diversity. 2012; 4: 419-52.**

An approach to the management of marine biodiversity was developed based on two levels of environmental diagnostics: (1) the characterization (to identify types), and (2) the evaluation (to define status and values). Both levels involve the production of maps, namely: (i) morphobathymetry and sedimentology; (ii) habitats; (iii) natural emergencies; (iv) degradation and risk; (v) weighted vulnerability; (vi) environmental quality; and, (vii) susceptibility to use. A general methodological aspect that must be stated first is the need of dividing the mapped area in territorial units corresponding to submultiples of the UTM grid and having different sizes according to the scale adopted. Territorial units (grid cells) are assigned to one of five classes of evaluation, ranging from high necessity of conservation or protection to non-problematic, unimportant or already compromised (according to the specific map) situations. Depending on the scale, these maps are suited for territorial planning (small scales, allowing for a synoptic view) or for administration and decision making (large scales, providing detail on local situations and problems). Mapping should be periodically repeated (diachronic cartography) to assure an efficient tool for integrated coastal zone management.

**Caroselli E, Mattioli G, Levy O, Falini G, Dubinsky Z, Goffredo S. Inferred calcification rate of a Mediterranean azooxanthellate coral is uncoupled with sea surface temperature along an 8° latitudinal gradient. Frontiers Zoo. 2012; 9(32). doi:10.1186/1742-9994-9-32.**

Correlations between sea surface temperature (SST) and growth parameters of the solitary azooxanthellate Dendrophylliid *Leptopsammia pruvoti* were assessed along an 8° latitudinal gradient on western Italian coasts (Mediterranean Sea), to check for possible negative effects of increasing temperature as the ones reported for a closely related, sympatric but zooxanthellate species. Results - Calcification rate was correlated with skeletal density but

not with linear extension rate, indicating that calcium carbonate deposition was preferentially allocated to keep a constant skeletal density. Unlike most studies on both temperate and tropical zooxanthellate corals, where calcification rate is strongly related to environmental parameters such as SST, in the present study calcification rate was not correlated with SST. Conclusions - The lower sensitivity of *L. pruvoti* to SST with respect to other sympatric zooxanthellate corals, such as *Balanophyllia europaea*, may rely on the absence of a temperature induced inhibition of photosynthesis, and thus the absence of an inhibition of the calcification process. This study is the first field investigation of the relationship between SST and the three growth parameters of an azooxanthellate coral. Increasing research effort on determining the effects of temperature on biological traits of the poorly studied azooxanthellate scleractinians may help to predict the possible species assemblage shifts that are likely to occur in the immediate future as a consequence of global climatic change.

**Layman C, Allgeier J, Yeager L, Stoner E. Thresholds of ecosystem response to nutrient enrichment from fish aggregations. Ecol. <http://dx.doi.org/10.1890/12-0705.1>.**

Biogeochemical hot spots can be driven by aggregations of animals, via excretion, that provide a concentrated source of limiting nutrients for primary producers. In a subtropical seagrass ecosystem, we characterized thresholds of ecological change associated with such hot spots surrounding artificial reef habitats. We deployed reefs of three sizes to aggregate fishes at different densities (and thus different levels of nutrient supply via excretion), and examined seagrass characteristics that reflect ecosystem processes. Responses varied as a function of reef size, with higher fish densities (on larger reefs) associated with more distinct ecological thresholds. For example, adjacent to larger reefs, %P content of seagrass (*Thalassia testudinum*) blades was significantly higher; fish densities on smaller reefs were insufficient to support sharp transitions in %P. Blade height was the only variable characterized by thresholds adjacent to smaller reefs, but lower fish densities (and hence nutrient input) on smaller reefs were not sufficient for luxury nutrient storage by seagrass. Identifying such complexities in ecological thresholds is crucial for characterizing the extent to which biogeochemical hot spots may influence ecosystem function at a landscape scale.

## **DIVING PHYSIOLOGY PUBLICATIONS**

**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% versus 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.

**Dardeau MR, Pollock NW, McDonald CM, Lang MA. The incidence rate of decompression illness in 10 years of scientific diving. *Diving Hyperb Med.* 2012; 42(4): 195-200.**

The American Academy of Underwater Science (AAUS) constitutes the single largest pool of organizations with scientific diving programs in North America. Organizational members submit annual summaries of diving activity and any related incidents. All diving records for a 10-year period between January 1998 and December 2007 were reviewed. Incidents were independently classified or reclassified by a four-person panel with expertise in scientific diving and diving safety using a previously published protocol. Subsequent panel discussion produced a single consensus classification of each case. A total of 95 confirmed incidents were reported in conjunction with 1,019,159 scientific dives, yielding an overall incidence rate of 0.93/10,000 person-dives. A total of 33 cases were determined to involve decompression illness (DCI), encompassing both decompression sickness and air embolism. The DCI incidence rate was 0.324/10,000 person-dives, substantially lower than the 0.9-35.3/10,000 rates published for recreational, instructional/guided, commercial and/or military diving. Scientific diving safety may be facilitated by a combination of relatively high levels of training and oversight, the predominance of shallow, no-decompression

diving and, possibly, low pressure to complete dives under less than optimal circumstances.

**Oztürk O, Tek M, Seven H. Temporomandibular disorders in scuba divers-an increased risk during diving certification training. *J Craniofac Surg.* 2012; 23(6): 1825-9. doi: 10.1097/SCS.0b013e3182710577.**

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.

**Xu W, Liu W, Huang G, Zou Z, Cai Z, Xu W. Decompression illness: clinical aspects of 5278 consecutive cases treated in a single hyperbaric unit. *PLoS One.* 2012;7(11):e50079. doi: 10.1371/journal.pone.0050079. Epub 2012 Nov 21.**

**BACKGROUND:** Decompression illness (DCI) is a major concern in pressure-related activities. Due to its specific prerequisite conditions, DCI is rare in comparison with other illnesses and most physicians are inexperienced in treatment. In a fishery area in northern China, during the past decade, tens of thousands of divers engaged in seafood harvesting and thousands suffered from DCI. We established a hyperbaric facility there and treated the majority of the cases. **METHODS AND RESULTS:** A total of 5,278 DCI cases were admitted in our facility from February 2000 through December 2010 and treated using our recompression schedules. Cutaneous abnormalities, joint and muscular pain and neurological manifestations were three most common symptoms. The initial symptom occurred within 6 h after surfacing in 98.9% of cases, with an overall median latency of 62 min. The shorter the latent time, the more serious the symptoms would be ( $p<0.0001$ ).

Nine cases died before recompression and 5,269 were treated using four recompression schedules, with an overall effectiveness rate of 99.3%. The full recovery rate decreased with the increase of the delay from the onset of symptoms to the treatment ( $p < 0.0001$ ). **CONCLUSIONS:** DCI presents specific occurrence rules. Recompression should be administered as soon as possible and should never be abandoned irrespective of the delay. The recompression schedules used were effective and flexible for variety conditions of DCI.

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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