



# E-SLATE

## American Academy of Underwater Sciences (AAUS)

### EDITORIAL NOTE – April 2012

Welcome to the April E-Slate. This month's issue features an update on the 2012 Conrad Limbaugh election, a call for abstracts and registration information for the 2012 AAUS Diving for Science symposium as well as many new job postings. We encourage you to submit new publications to share with the membership. It is a great opportunity to highlight research from your home institution. In addition, 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

#### Return to Mariana Trench

James Cameron, Canadian filmmaker, reached the deepest region of the world's ocean on March 26, 2012. He piloted the one-person *Deepsea Challenger* to the bottom of the Mariana Trench. The Challenger Deep has a known maximum depth of 35,800 ft (10,912 m; ambient pressure of approximately 1086 atmospheres absolute). The only previous manned visit to the bottom of the trench was made by Lieutenant Don Walsh and Jacques Piccard in the US Navy-owned bathyscaphe *Trieste* on January 23, 1960.

#### AAUS Welcomes New Organizations

JF White Contracting  
Junior Scientist in the Sea  
Tetra Tech EC

#### AAUS Conrad Limbaugh Memorial Award

Due to issues with polling availability on the website, voting for this year's Conrad Limbaugh Memorial Award will be open from April 01-31, 2012. All full voting members will receive a direct email with instructions for voting as well as the profile of each nominee. Please vote again since March votes are not valid. Polls close 11:59 pm PST on April 30. Please contact AAUS ([aaus@disl.org](mailto:aaus@disl.org)) with any questions.

#### AAUS Symposium 2012

The 2012 AAUS Symposium will be held in Monterey, California September 24-29, 2012, hosted by the Monterey Bay Aquarium, University of California Santa Cruz and Moss Landing Marine Laboratories. The Hyatt Regency will serve as the symposium hotel. Events include pre-conference workshops, the Diving Safety Officer meeting, AAUS business meeting and two days of science talks.

#### Planned workshops:

- PSI – VCI certification and refresher courses
- Desert Star Navigation
- Organismal Collection Techniques
- DAN FA Pro Instructor Certification
- Pacific Coast Species ID/Reef Check CA Methodology
- Oceanic Equipment Repair
- Photo Techniques for Scientific Divers
- New DSO Orientation
- Organizational Member Poster Night

There will be boat and shore diving opportunities as well as our annual Bubble Breaker welcome sponsored by Ocean Enterprises and a second social hosted by Backscatter. September is a beautiful time of year in Monterey but also a very busy time for other conferences. Early travel booking is recommended. You can visit our website to register directly at <http://www.cvent.com/d/kcqlds>. Contact the AAUS office at [aaus@disl.org](mailto:aaus@disl.org) for more information.

#### Call for Abstracts – AAUS 2012

Abstracts appropriate for the 2012 AAUS symposium can be submitted electronically to [www.aaus.org](http://www.aaus.org) until June 01, 2012. Please put "AAUS symposium abstract -" followed by your name in the message line to facilitate tracking. The minimum manuscript obligation is an extended abstracts (800-1200 words). (Note: longer manuscripts can be submitted if authors prefer - the 2011 proceedings were close to evenly split between extended abstracts and full papers). Notification on the disposition of submitted abstracts will be returned to the first author electronically by July 01. The deadline for final extended abstract or manuscript is August 01 so the published proceedings will be available at the fall meeting. Inclusion in the proceedings is a requirement of presentation. Contact Diana Steller ([dsteller@mml.calstate.edu](mailto:dsteller@mml.calstate.edu)) for more information.

#### AAUS Diving Reciprocity with NOAA

AAUS diving reciprocity with NOAA is renewed through December 31, 2012 for employees of current, active AAUS organizational member programs who are covered by their institutions for costs associated with any injuries that may occur while participating in diving operations under NOAA auspices. Such coverage includes, but is not limited to: emergency transportation, hyperbaric or other medical treatment, hospitalization, and compensation for lost wages associated with extended absence due to work-related medical emergencies. Reciprocity is based solely on the performance of scientific diving tasks as outlined in 29 CFR 1910.401 Subpart T. AAUS scientific divers must present to

the NOAA Divemaster a signed letter of reciprocity from their DSO verifying workers compensation coverage and must have completed three dives within 90 days of project start-up. In addition to the current AAUS medical standards, chest X-ray (CXR), spirometry, and complete blood count (CBC) must also be done.

The consensus of the NOAA Diving Medical Review Board (NDMRB) is that the current NOAA medical standards are appropriate to evaluate the medical readiness of NOAA divers and standards must be equivalent for reciprocity. The NDMRB is currently conducting research to further investigate what standards should be required for reciprocity and is supportive of AAUS' aggressive strengthening of the cardiovascular screening.

### **Accreditation Program Update**

The charge to the ad hoc Accreditation Committee, co-chaired by George Peterson and Steve Clabuesch, was to evaluate options and make recommendations for an AAUS OM quality control mechanism and to produce associated materials for final approval by the Board of Directors. Almost two dozen members have provided input and the Committee acknowledges that AAUS has been "certifying" that OMs are current and in compliance with AAUS standards without a means to validate or verify such status through peer review, an indefensible position and imprudent fiduciary policy. AAUS has experienced explosive and unsustainable growth over the last few years. The Accreditation Program is a tool to positively recognize OMs that are in full compliance with AAUS standards and serves as a mechanism to help manage growth in a sustainable way. Mentorship, quality control and compliance mechanisms need to be developed and implemented in parallel with the Accreditation Program and will serve to create a holistic approach towards quality assurance.

A policy has been adopted by the AAUS Board of Directors for rollout and future changes to Standards that ensures timely consideration of membership comments. This policy will also be applied to the Accreditation Program. The Accreditation Committee's efforts have now been ongoing for two years and the program template was revised based on input, recognizing that the main obstacles are perceived as being cost and liability issues. A timeline and proof of concept mechanism is now in place to test the Accreditation Program for OMs who have specifically requested this from AAUS and volunteered to undergo peer review. The mechanism addresses a protocol for small diving programs without, and large diving programs with, infrastructure. The Accreditation Committee will submit its findings to the Board of Directors who will solicit comments from the membership. These beta tests will be conducted over the summer on a group of four volunteer OMs in both an on-site and virtual mode to compare modalities.

### **AAUS Website**

AAUS is experiencing difficulties with the current website, [aaus.org](http://aaus.org). Please contact the AAUS office at [aaus@disl.org](mailto:aaus@disl.org) or 251-591-3775 with any issues or questions. We expect to launch our new custom website w in late spring.

### **2012 Organizational Member Dues**

2012 OM dues are now past due. Please check your profile at [www.aaus.org](http://www.aaus.org) to be sure all of the information is correct as we begin to migrate our database to our new website.

### **Rebreather Forum 3.0**

AAUS has partnered with DAN and PADI to co-sponsor and convene RF3, May 18-20, 2012 in Orlando, FL (<http://www.rf30.org>). RF3.0 will provide AAUS Diving Officers and scientific divers with an opportunity to thoroughly consider the possibilities of incorporating rebreather technology into the underwater research tool box. AAUS, DAN and PADI are bringing together experts to present and discuss issues relevant to rebreathers, rebreather safety and to help plot a forward path.

### **2011 AAUS Statistics**

2011 statistics are due now. Please begin compiling and submitting these numbers! Statistics are submitted at <http://stats.diveaaus.com>. Please review 'AAUS Statistics Collection Criteria and Definitions' (Statistics Collection page) or contact Cheryl Thacker ([cthacker@ehs.ufl.edu](mailto:cthacker@ehs.ufl.edu)) or Mike Dardeau ([mdardeau@disl.org](mailto:mdardeau@disl.org)) with questions.

## **FUNDING/SCHOLARSHIPS**

### **AAUS 2012 Student Scholarships**

The AAUS Foundation awards two scholarships to graduate students engaged in, or planning to begin, a research project in which diving is used as an important research tool or studying diving science. The Kevin Gurr Scholarship awards \$3000 to a Master program student. The Kathy Johnston Scholarship awards \$3000 to a Doctoral student. AAUS may also award two additional \$1500 scholarships to the next top-ranked proposals. If the additional scholarships are awarded, they may be split between Master and Doctoral programs or awarded within a single program.

Applicants must fulfill the following requirements: be a current member of AAUS (student or full member); be accepted and enrolled in a Master or Doctoral program; agree to write an article for the E-Slate describing the proposed research; and present the results of their research at an AAUS symposium or other scientific meeting within one year of the project's completion. Applications are submitted electronically; including a 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). A letter of support from a faculty advisor must be submitted electronically. **Proposal deadline is June 30.** Scholarship winners will be announced October 01. For more information and an online application, visit [www.aausfoundation.org](http://www.aausfoundation.org), or contact the Scholarship Committee Chair at [aaus@disl.org](mailto:aaus@disl.org).

## STUDENT OPPORTUNITIES

### 2012 Scientific Dive Course at Friday Harbor

The University of Washington (UW) Friday Harbor Laboratories (FHL) will conduct a scientific dive course from August 28 through September 09. This is a short intensive course designed to provide the basic requirements for becoming certified as a scientific diver according to AAUS standards. It includes First Aid/CPR/Oxygen for scuba emergencies training and Rescue diver certification. Course fees will include: room and board at FHL for 13 days, DAN and PADI certification cards, and Rescue training e-learning materials. The course is open to scientists and students at any level of study who meet the requirements for AAUS certification: a minimum of 20 logged dives and medical clearance. It is ideal for undergraduates and graduate students who have achieved an advanced level of recreational diving and aim to pursue subtidal research in the near future. Students must provide all their own gear (except for scuba cylinders) appropriate for cold water and meeting UW diving safety regulations. The deadline for applications is May 01. For more information, please visit the FHL website: <http://depts.washington.edu/fhl/studentSummer2012.html#SumB-xx> or contact the FHL DO, Pema Kitaeff, at [pema@uw.edu](mailto:pema@uw.edu).

### Maritime Archaeology Field School in Bermuda

Saint Mary's College of California and the University of Rhode Island will be offering a joint Field School in Maritime Archaeology in Bermuda July 16 to August 08, 2012. Training leading to AAUS qualification as a Scientific Diver-in-Training will be provided in advance of departure for Bermuda. Classroom work related to maritime history and maritime archaeological field methods will comprise week one of the field school. Underwater research and documentation of 16th and 17th century shipwrecks will be conducted in Bermuda during the remaining weeks. Direct questions to [jallan@stmarys-ca.edu](mailto:jallan@stmarys-ca.edu) or [rodmather@mail.uri.edu](mailto:rodmather@mail.uri.edu).

## JOB OPPORTUNITIES

### Senior Diving Officer

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. The deadline for applications is April 09, 2012. Please see the following links for online description and application:

[12R-JC-297489-MPA-OUSS](https://www.usajobs.gov/GetJob/ViewDetails/310135200)

<http://www.usajobs.gov/GetJob/ViewDetails/310135200>

### Diving Safety Officer

Texas A&M University at Galveston has a vacancy in the Diving Safety Officer (DSO) position. The Diving Safety Officer at [Texas A&M University at Galveston](http://www.tamug.edu) will provide general oversight of the health and safety aspects of all diving programs (scientific, instructional, recreational, etc.) in accordance with University and training agency policies and accepted safe diving practices. Review and approve all diving and emergency plans associated with TAMUG diving activities. Liaise with the TAMUG Dive Control Board on all aspects of dive planning and safety. Supervise diving instruction and evaluate all training programs, including all classes that may incorporate diving as a component. Oversee TAMUG staff involved in diving instruction, ensuring training agency and TAMUG diving policy compliance; oversee and supervise student workers and temporary employees of the TAMUG dive program as needed; maintain staffing levels necessary for the achievement of appropriate student-to-staff ratios. Instruct and/or staff diving courses as needed; maintain programs and classes for the development and certification of diving leadership positions. Other duties as required. Interested candidates are encouraged to contact TAMUG Waterfront Operations Director, Allan Post ([posta@tamug.edu](mailto:posta@tamug.edu)) or <https://tamujobs.tamu.edu/applicants/jsp/shared/frameSet/FrameSet.jsp?time=1332368422318>

### Dive Operations Supervisor

The Florida Aquarium is seeking a dive operations supervisor (DOS). The DOS assists the Manager of Dive Operations (MDO), manages activities related to the Florida Aquarium public dive programs and exhibit maintenance activities and schedules, supervises and evaluates weekend Dive Masters. In addition the individual is to assist the MDO in managing the dive locker equipment, maintenance and inventory and supports scientific diving in the field (collecting, research, projects, etc.) as needed.

### Underwater Explorers Program

Monterey Bay Aquarium is hiring instructors and supervisors for the Underwater Explorers Program. Instructors will be responsible for delivering Underwater Explorers programs to the public, serve as the primary response team for in-water safety and rescues of participants and teaching children ages 8-13 about the natural history of our tide pools and ocean. Instructors will also introduce participants to the use of specialized scuba gear. Instructors are also responsible for daily support of husbandry for the Great Tide Pool exhibit, as well as minor repair of selected Underwater Explorers equipment. The UE Assistant

Supervisor will assist the UE Supervisor in the daily operations and logistics of the program. In addition, they will be required to perform all duties of the UE Instructor position. All staff must be divemasters or higher. Apply online with the jobs link at [www.montereybayaquarium.org](http://www.montereybayaquarium.org).

### **Safety Program Manager/Dive Safety Officer**

The Safety Program Manager/DSO for Clearwater Marine Aquarium will work with all staff, including department heads, within the organization and a diverse team of volunteer divers, in the implementation of overall CMA safety policies and dive safety procedures as well as establish and enforce guidelines to ensure safety throughout the facility for both staff and visitors. The manager will possess a broad knowledge base in all aspects OSHA requirements and guidelines for safety at CMA and safe diving protocols at CMA. The Safety Program Manager will also be responsible for periodic inspections of CMA's facilities and equipment to ensure all local and federal safety codes and guidelines are met. Please submit your cover letter and resume to [d-desantis@cmaquarium.org](mailto:d-desantis@cmaquarium.org).

## **UPCOMING EVENTS**

### **DAN DMT Course**

DAN Diver Medical Technician (DMT) program will be offered April 13-20. To inquire about availability or register for any DAN continuing education courses, contact DAN Education (919-684-2948; [oxygen@diversalernetnetwork.org](mailto:oxygen@diversalernetnetwork.org)).

### **Second Annual Dive Medicine Conference**

The second Annual Dive Medicine Conference at Danbury Hospital, CT is scheduled for Saturday, April 14, 2012. Contact Martin Folan ([mfolan9371@att.net](mailto:mfolan9371@att.net)) for details.

### **DAN Diving and Hyperbaric Medicine Course**

The 71<sup>st</sup> DAN Diving and Hyperbaric Medicine Course will be held April 28 to May 05 at the Fort Young Hotel in Dominica. This six-day course is designed primarily for physicians. Emergency medical personnel, paramedics, nurses and professionals with interest in diving medicine will also find the course valuable. Contact DAN Education at 919-684-2948, ext. 556 or 800-496-446-2671, ext. 556 or [cme@dan.org](mailto:cme@dan.org). Visit: <http://www.diversalernetnetwork.org/?a=events&eventNo=989>.

## **NEW PUBLICATIONS**

**Dee LE, Witman JD, Brandt M. Refugia and top-down control of the pencil urchin *Eucidaris galapagensis* in the Galápagos Marine Reserve. *J Exp Mar Biol Ecol.* 2012; 417:135-43.**

Although sea urchins can strongly influence the structure of benthic communities and are abundant in the Galápagos Islands, factors mediating predation on urchins have not been studied experimentally. Here, we examine how habitat structure and behavioral patterns of prey influence predation on the pencil urchin *Eucidaris galapagensis*, an abundant grazer in rocky subtidal habitats. Results indicate that the distribution, abundance and body sizes of *E. galapagensis* vary predictably by habitat in the central Galápagos. Urchins were five times more abundant and significantly smaller in rubble than in exposed ledge habitats. We thus hypothesized that rubble habitats provide a refuge from predation, and conducted tethering manipulations using small and large urchins as prey. Predation by the hogfish, *Bodianus diplotaenia*, triggerfishes, and the sea star *Pentacaster cumingi*, was significantly higher in exposed than in rubble habitats for small urchins, indicating that rubble habitats represent a refuge. In addition, urchin activity over a 24-hour period indicated that *E. galapagensis* were significantly more abundant on exposed substrate at night than during the day as they emerged from refugia at dusk. Since the fish that prey on *E. galapagensis* are predominantly diurnal, we suggest that the nocturnal activity patterns of the urchins represent a predator avoidance strategy. These results underscore the importance of considering spatial refugia and prey behavior in investigations of top-down control of sea urchins in the Galápagos Marine Reserve.

**Doney SC, Ruckelshaus M, Duffy JE, Barry JP, Chan F, English CA, Galindo HM, Grebmeier JM, Hollowed AB, Knowlton N, Polovina J, Rabalais NN, Sydeman WJ, Talley LD. Clim Change Impacts *Mar Ecol.*; *Ann Review Mar Sci.* 2012 4:11-37.**

In marine ecosystems, rising atmospheric CO<sub>2</sub> and climate change are associated with concurrent shifts in temperature, circulation, stratification, nutrient input, oxygen content, and ocean acidification, with potentially wide-ranging biological effects. Population-level shifts are occurring because of physiological intolerance to new environments, altered dispersal patterns, and changes in species interactions. Together with local climate-driven invasion and extinction, these processes result in altered community structure and diversity, including possible emergence of novel ecosystems. Impacts are particularly striking for the poles and the tropics, because of the sensitivity of polar ecosystems to sea-ice retreat and poleward species migrations as well as the sensitivity of coral-algal symbiosis to minor increases in temperature. Midlatitude upwelling systems, like the California Current,

exhibit strong linkages between climate and species distributions, phenology, and demography. Aggregated effects may modify energy and material flows as well as biogeochemical cycles, eventually impacting the overall ecosystem functioning and services upon which people and societies depend.

**Fisher R, Knowlton N, Brainard RE, Caley MJ. Differences among major taxa in the extent of ecological knowledge across four major ecosystems. PLoS ONE 2012; 6(11): e26556.**

Existing knowledge shapes our understanding of ecosystems and is critical for ecosystem-based management of the world's natural resources. Typically this knowledge is biased among taxa, with some taxa far better studied than others, but the extent of this bias is poorly known. In conjunction with the publically available World Registry of Marine Species database (WoRMS) and one of the world's premier electronic scientific literature databases (Web of Science®), a text mining approach is used to examine the distribution of existing ecological knowledge among taxa in coral reef, mangrove, seagrass and kelp bed ecosystems. We found that for each of these ecosystems, most research has been limited to a few groups of organisms. While this bias clearly reflects the perceived importance of some taxa as commercially or ecologically valuable, the relative lack of research of other taxonomic groups highlights the problem that some key taxa and associated ecosystem processes they affect may be poorly understood or completely ignored. The approach outlined here could be applied to any type of ecosystem for analyzing previous research effort and identifying knowledge gaps in order to improve ecosystem-based conservation and management.

**Klingmann C. Inner ear decompression sickness in compressed-air diving. Undersea Hyperb Med. 2012 Jan-Feb;39(1):589-94.**

**INTRODUCTION:** Inner ear decompression sickness (IEDCS) has become more frequently reported in recreational diving. **METHODS:** We examined 34 divers after IEDCS and analyzed their dive profiles, pattern of symptoms, time of symptom onset and the association with a right-to-left shunt (r/l shunt). **RESULTS:** Four divers used mixed gas and were excluded from the analysis. Of the remaining 30 divers, 25 presented with isolated IEDCS alone, while five divers had additional skin and neurological symptoms. All divers presented with vertigo (100%), and 12 divers reported additional hearing loss (40%). All symptoms occurred within 120 minutes (median 30 minutes) of ascent. Twenty-two of 30 divers (73.3%) showed a r/l shunt. **CONCLUSION:** A possible explanation for the frequent association of a r/l shunt and the dominance of vestibular rather than cochlear symptoms could be attributed to the different blood supply of the inner ear structures and the different size of the

labyrinthine compartments. The cochlea has a blood supply up to four times higher than the vestibular part of the inner ear, whereas the vestibular fluid space is 30% larger. The higher prevalence of symptoms referable to the less well-perfused vestibular organ provides further evidence that persistent local inert gas supersaturation may cause growth of incoming arterial bubbles and may therefore be an important pathophysiological factor in IEDCS.

**Parravicini V, Rovere A, Vassallo P, Micheli F, Montefalcone M, Morri C, Paoli C, Albertelli G, Fabiano M, Bianchi C. Understanding relationships between conflicting human uses and coastal ecosystems status: A geospatial modeling approach. Ecol Indicators. 2012; 19: 253-63.**

Human use of ecosystem resources and services is increasing worldwide, generating pressures that alter ecosystem structure, functioning and provision of services. Unexpected ecosystem change is becoming frequent, and the complex ways through which multiple human pressures may interact leave conservation practitioners and natural resource managers faced with high uncertainty. We developed a geospatial approach for modeling the complex relationships between multiple human pressures and coastal ecosystems status. This framework was then used to produce maps of the expected status of marine coastal ecosystems resulting from variation in the cumulative human pressure. The geospatial modeling approach we developed was tested on an emblematic study case requiring marine spatial planning, i.e. a recently established marine protected area (MPA) that will have to coexist with the expansion of a close commercial harbor. In the study case presented, our modeling approach was used to predict the status of coastal ecosystems resulting from different management alternatives. Results showed that should Port Authority support MPA in reducing human pressures in the area, coastal ecosystems would not be expected to further deteriorate as a consequence of harbor expansion. Our approach proved effective in modeling complex interaction among multiple pressures (e.g. synergisms) and predicting potential future scenarios. The implementation of this approach into geographical information systems (GIS) allows managers to represent the expected outcomes of their planned conservation efforts, thereby representing an important decision-support tool for finding efficient management solutions in the face of complex interactions and high uncertainty.

**Pendergast DR, Senf C, Lundgren CE. Is the rate of whole-body nitrogen elimination influenced by exercise? Undersea Hyperb Med. 2012 Jan-Feb;39(1):595-604.**

**BACKGROUND:** Because it has earlier been shown that exercise 24 or two hours pre-dive may suppress the appearance of venous gas bubbles (VGB) in connection with the dive, we studied whether exercise before or during N<sub>2</sub> elimination would influence the rate of the latter.

Nitrogen elimination was recorded in eight volunteers breathing a normoxic O<sub>2</sub>+argon mixture for two hours. The N<sub>2</sub> washout was preceded two (Condition A) or 24 hours (Condition B) earlier, by one hour of exercise at 85% VO<sub>2</sub> max (two hours of exercise interspersed with two hours of rest). In separate experiments, exercise at -40% of VO<sub>2</sub> max was performed throughout the two-hour washout (Condition C), and control experiments (Condition D) with denitrogenation without exercise were also performed. RESULTS: There were no significant differences among conditions for the total N<sub>2</sub> eliminated (904±196 mL). The half-times of N<sub>2</sub> washout for A (35.2±10.8 minutes) and B (31.9±8.6 minutes) did not differ from control washouts. The rate of washout in C increased 14% compared to D (half-time: 30.4±7.6 vs. 34.5±7.8 minutes, p=0.002), and correlated with cardiac output. CONCLUSION: Exercise 24 or two hours pre-N<sub>2</sub> washout did not affect it, suggesting that the decreased VGB scores noted by others in dives preceded by conditions similar to A and B are not due to changes in nitrogen exchange but rather to factors related to bubble formation and/or appearance. That N<sub>2</sub> elimination is enhanced by concomitant exercise makes physiological sense but does not necessarily explain the observation by others of a reduced risk of decompression sickness with exercise before diving.

**Scheel D, Bisson L. Movement patterns of giant Pacific octopuses, *Enteroctopus dofleini* (Wülker, 1910). J Exp Mar Biol Ecol. 2012; 416:21-31.**

We attached sonic transmitters to, and tracked, 40 giant Pacific octopuses (*Enteroctopus dofleini*) ranging from <1 to 21 kg in size in south-central Alaska using near-continuous tracking by fixed-array receivers and intermittent tracking with a mobile receiver. We documented area use, daily activity patterns, spatial scale of movements and whether these differed by octopus size, and whether octopuses actively selected habitats. Near-continuous fixed tracking provided positions about every 4 min over a limited area, while intermittent mobile tracking provided positions every 1–6 h but over open and larger areas. Mantle-mounted transmitters on modified Peterson disks had >83% retention to the end of a tracking period (range <1 day [before animal left the study area] to at least 88 days post-release), an improvement over published studies. Octopuses were found to be stationary or hiding 94% of the time. Otherwise, octopuses were active throughout the day but more so from midnight to 0500. During low tides, movements were restricted for animals in intertidal habitats but not for those deeper. Maximum movement distance from release was 4.8 km (by a 16.5 kg female). Minimum convex polygon area use averaged 4,300 m<sup>2</sup> for the smallest animals to an average over 50,000 m<sup>2</sup> for the largest during 2 to 20 days of tracking, substantially larger than previously reported. Larger octopuses moved further and used greater area than smaller animals, but differences between sexes were not

significant. Stationary behavior and periods without detection (rest) by fixed near-continuous tracking were bimodally distributed, with peaks <3 h duration and >18–48 h. Direct movements (indicating relocation or den switching) were common at night, central-tendency movements (indicating localized area use and return to den) were common at dawn, and stationary behavior was common in daylight, although each pattern occurred at all periods. Central-tendency movements recorded by intermittent tracking were oriented parallel to contours, while movements without central-tendency crossed contours, suggesting that animals navigate by contour following to return to a known den. During a relocation experiment, octopuses released at shallow depths moved deeper and those released deeper moved shallower, both into habitats with greater kelp cover. Although > 90% of their time was spent stationary and hiding, *Enteroctopus dofleini* utilizes information about its environment (contour following), selects habitats (preference for more kelp cover), and occupies large use areas (minimum convex polygons) by making substantial direct movements from previous use areas.

**Selig ER, Casey KS, Bruno JF. Temperature-driven coral decline: the role of marine protected areas. Global Change Biol. 02 March 2012; doi: 10.1111/j.1365-2486.2012.02658.x**

Warming ocean temperatures are considered to be an important cause of the degradation of the world's coral reefs. Marine protected areas (MPAs) have been proposed as one tool to increase coral reef ecosystem resistance and resilience (i.e. recovery) to the negative effects of climate change, yet few studies have evaluated their efficacy in achieving these goals. We used a high resolution 4 km global temperature anomaly database from 1985–2005 and 8040 live coral cover surveys on protected and unprotected reefs to determine whether or not MPAs have been effective in mitigating temperature-driven coral loss. Generally, protection in MPAs did not reduce the effect of warm temperature anomalies on coral cover declines. Shortcomings in MPA design, including size and placement, may have contributed to the lack of an MPA effect. Empirical studies suggest that corals that have been previously exposed to moderate levels of thermal stress have greater adaptive capacity and resistance to future thermal stress events. Existing MPAs protect relatively fewer reefs with moderate anomaly frequencies, potentially reducing their effectiveness. However, our results also suggest that the benefits from MPAs may not be great enough to offset the magnitude of losses from acute thermal stress events. Although MPAs are important conservation tools, their limitations in mitigating coral loss from acute thermal stress events suggest that they need to be complemented with policies aimed at reducing the activities responsible for climate change.

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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