



# Caribbean Marine Science

February 2009

Official Newsletter of the AMLC  
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## Association News

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### From the Editors' desk

Our greetings to all the AMLC members. We are enthusiastic and getting ready for our upcoming meeting in Dominica this May. There has been a constant registration and submission of abstracts for presentations that will once again make our meetings a dynamic and successful event. We urge our members and collaborators to continue with their support to the Association and to participate actively in our future development.

We would also like to remind all our members that there will be elections for new officers during the meeting and that we are still open for nominations for the Vice-president, Information Officer, Treasurer, Membership Director, and Member-at-Large positions. All AMLC members in good standing, including students, are eligible for these offices.

Please send your nomination to Ernesto Weil ([eweil@caribe.net](mailto:eweil@caribe.net)).

This issue includes interesting articles on the effect of global warming and Caribbean connectivity (executive summary of a long report) in our General Interest section with the corresponding internet links and/or source e-mail contact address if you would like to have access to the full articles or reports. Information for course offerings for the coming summer can be found in our Summer Course section and new book releases in the new books section.

### Future Meetings of the AMLC

2009 - Scientific Conference – This meeting is scheduled for Monday-Friday, May 25-29, 2009 in Rosseau, Commonwealth of Dominica. Sascha Steiner at ITME will host the meeting and is serving as this year's AMLC President. The early-registration dead-line is coming up fast -- March 1! You can register and submit your abstract on the AMLC website: [www.amlc-carib.org](http://www.amlc-carib.org).

### AMLC List Server

The purpose of the AMLC list server is to facilitate communication and foster collaboration between and among our members. We hope all AMLC members will take advantage of this service – if you have any news, requests, or questions to distribute to fellow AMLC members, just send a message to the email address below. On-line discussions among members concerning Caribbean marine issues are encouraged. Don't be shy! The list server address is: [members@lists.amlc-carib.org](mailto:members@lists.amlc-carib.org)

Only AMLC members in good standing can post to the list. Messages not from a subscribed member will

not be accepted. Current AMLC members are automatically subscribed with the list controlled by Dr. David Wilson, AMLC's Membership Director, and new members are added as they join AMLC. The newsletter will be circulated electronically through our list server, which insures delivery and control over who receives the mailing.

As always, we request contribution of articles and other news items for the Newsletter from our members and readers. We have a very diverse membership involved in many different areas of research. Your Newsletter is an efficient way of sharing information about your projects, or even better, finding help or cooperation from other members of the Association.

**Editors: Ernesto Weil and Isabel Urreiztieta. Contributing Editor: Steve LeGore**

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## *General Interest*

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### **Caribbean Connectivity: Implications for Marine Protected Area Management**

Grober-Dunsmore, R. and B.D. Keller

Tropical marine ecosystems in the Caribbean region are inextricably linked through the movement of pollutants, nutrients, diseases, and other stressors, which threaten to further degrade coral reef communities. The magnitude of change that is occurring within the region is considerable, and solutions will require investigating pros and cons of networks of marine protected areas (MPAs), cooperation of neighboring countries, improved understanding of how external stressors degrade local marine resources, and ameliorating those stressors.

Connectivity can be broadly defined as the exchange of materials (e.g., nutrients and pollutants), organisms, and genes and can be divided into: 1) genetic or evolutionary connectivity that concerns the exchange of organisms and genes, 2) demographic connectivity, which is the exchange of individuals among local groups, and 3) oceanographic connectivity, which includes flow of materials and

circulation patterns and variability that underpin much of all these exchanges. Presently, we understand little about connectivity at specific locations beyond model outputs, and yet we must manage MPAs with connectivity in mind. A key to successful MPA management is how to most effectively work with scientists to acquire the information managers need.

Oceanography connectivity is poorly understood, and even less is known about the shape of the dispersal curve for most species. Dispersal kernels differ for various systems, species, and life histories and are likely highly variable in space and time. Furthermore, the implications of different dispersal kernels on population dynamics and management of species is unknown. However, small dispersal kernels are the norm - *not* the exception. Linking patterns of dispersal to management options is difficult given the present state of knowledge. The behavioral component of larval dispersal has a major impact on where larvae settle. Individual larval behavior and life history details are required to produce meaningful simulations of population connectivity. Biological inputs are critical determinants of dispersal outcomes beyond what can be gleaned from models of passive dispersal.

There is considerable temporal and spatial variation to connectivity patterns. New models are increasingly being developed, but these must be validated to understand upstream-downstream neighborhoods, dispersal corridors, stepping stones, and source/sink dynamics. At present, models are mainly useful for providing generalities and generating hypotheses. Low-technology approaches such as drifter vials and oceanographic drogues are useful, affordable options for understanding local connectivity. The "silver bullet" approach to MPA design may not be possible for several reasons. Genetic connectivity studies reveal divergent population genetic structures despite similar larval life histories. Historical stochasticity in reproduction and/or recruitment likely has important, long lasting consequences on present day genetic structure.

Within the region, there are several important biogeographic boundaries such as the mouth of the Amazon basin and the Mona Passage. Several species have similar dispersal potential, but varying genetic

structures; the genetic breaks in different geographic locations indicates that larval duration, geographic distributions, and oceanographic currents are poor predictors of population structure. There is increasing evidence of local-scale larval retention. Empirical studies suggest that connectivity may be more localized than previously thought.

The Caribbean region shares common threats such as tourism, sewage, overdevelopment, cruise ships, and movement of organisms. Stressors to marine communities in the region can only be managed by working together to build bridges of understanding by supporting research and discussion on this important topic. Connecting scientists and managers will require engaging in tactical, specific actions involving panmixis of disciplines and new standards for conservation products. Because seascapes outside of MPAs are degraded by habitat loss, sewage, and coastal development, connectivity is rarely on the minds of most MPA managers. Rather, managing for localized stressors typically dominates agendas, but to effectively conserve marine ecosystems Caribbean-wide will require reaching across borders. Knowledge of connectivity will help in deciding whether to create a single large or several small MPAs in a particular location. In complex seascapes, species are flexible in their use of habitat. Some have ontogenetic migrations where different habitats are used at different stages of their life. Habitat use is variable across families and species, with cross-shelf location as well as habitat type often being important in determining the distribution of reef fishes.

Many species depend upon nursery habitats during early life history, but this is not always an obligate relationship. The relative importance of nursery habitats to sustain reef fish populations is not known. Therefore, it is difficult to estimate the minimum nursery area required to conserve populations. Acquiring direct information on the importance of particular habitats for various species is often difficult, though advancements in techniques such as acoustic tagging and stable isotope ratios are improving our ability to understand demersal connectivity. Reef fishes move from inside to outside the boundaries of MPAs. Movement of fishes is influenced by the underlying seascape, with certain habitat features appearing to act as inhibitors to movement. The ability of an ecosystem to recover

from disturbance may be influenced by habitat connectivity. Ontogenetic mechanisms of ecosystem connectivity may increase the resilience of Caribbean reefs to climate-induced changes such as hurricane disturbance. Particular habitats such as seagrass and mangrove may play a functional role in maintaining connectivity in the Caribbean. Protection of multi-species spawning aggregations throughout the Caribbean region is recommended. Spawning aggregations are extremely vulnerable to overfishing. Scientific evidence suggests that spawning locations may function to retain larvae; if so, then spawning aggregations should be managed as separate stocks

Please find the full report at the following website:

<http://sanctuaries.noaa.gov/science/conservation/welcome.html>

## **Troubled waters**

From *The Economist* print edition

*The sea is suffering, mostly at the hand of man, says John Grimond.*

*All of us have in our veins the exact same percentage of salt in our blood that exists in the ocean...And when we go back to the sea...we are going back from whence we came. John Kennedy*

HUMAN beings no longer thrive under the water from which their ancestors emerged, but their relationship with the sea remains close. Over half the world's people live within 100 km (62 miles) of the coast; a tenth are within 10km. On land at least, the sea delights the senses and excites the imagination. The sight and smell of the sea inspire courage and adventure, fear and romance. Though the waves may be rippling or mountainous, the waters angry or calm, the ocean itself is eternal. Its moods pass. Its tides keep to a rhythm. It is unchanging.

Or so it has long seemed. Appearances deceive, though. Large parts of the sea may indeed remain unchanged, but in others, especially in the surface and coastal waters where 90% of marine life is to be found, the impact of man's activities is increasingly plain. This should hardly be a surprise. Man has changed the landscape and the atmosphere. It would be odd if the seas, which he has for centuries used for food, for transport, for dumping rubbish and, more recently, for recreation, had not also been affected.

The evidence abounds. The fish that once seemed an inexhaustible source of food are now almost everywhere in decline: 90% of large predatory fish (the big ones such as tuna, swordfish and sharks) have gone, according to some scientists. In estuaries and coastal waters, 85% of the large whales have disappeared, and nearly 60% of the small ones. Many of the smaller fish are also in decline. Indeed, most familiar sea creatures, from albatrosses to walruses, from seals to oysters, have suffered huge losses.



All this has happened fairly recently. Cod have been caught off Nova Scotia for centuries, but their systematic slaughter began only after 1852; in terms of their biomass (the aggregate mass of the species), they are now 96% depleted. The killing of turtles in the Caribbean (99% down) started in the 1700s. The hunting of sharks in the Gulf of Mexico (45-99%, depending on the variety) got going only in the 1950s.

The habitats of many of these creatures have also been affected by man's activities. Cod live in the bottom layer of the ocean. Trawler men in pursuit of these and other ground fish like Pollock and haddock drag steel weights and rollers as well as nets behind their boats, devastating huge areas of the sea floor as they go. In the Gulf of Mexico, trawlers ply back and forth year in year out, hauling vast nets that scarify the seabed and allow no time for plant and animal life to recover. Off New England, off west Africa, in the Sea of Okhotsk north of Japan, off Sri Lanka, wherever fish can still be found, it is much the same story.

Coral reefs, whose profusion of life and diversity of ecosystems make them the rainforests of the sea, have suffered most of all. Once home to prolific concentrations of big fish, they have attracted human hunters prepared to use any means, even dynamite, to

kill their prey. Perhaps only 5% of coral reefs can now be considered pristine, a quarter have been lost and all are vulnerable to global warming.



A hotter atmosphere has several effects on the sea. First, it means higher average temperatures for surface waters. One consequence for coral reefs is that the symbiosis between the corals and algae that constitute a living reef is breaking down. As temperatures rise, the algae leave or are expelled, the corals take on a bleached, white appearance and may then die.

### Hotter water, slimier slime

Warming also has consequences for ice: it melts. Melting sea ice affects ecosystems and currents. It does not affect sea levels, because floating ice is already displacing water of a weight equal to its own. But melting glaciers and ice sheets on land are bringing quantities of fresh water into the sea, whose level has been rising at an average of nearly 2 millimeters a year for over 40 years, and the pace is getting faster. Recent studies suggest that the sea level may well rise by a total of 80 centimeters this century, though the figure could plausibly be as much as 2 meters.

The burning over the past 100 years or so of fossil fuels that took half a billion years to form has suddenly, in geological terms, put an enormous amount of carbon dioxide into the atmosphere. About a third of this CO<sub>2</sub> is taken up by the sea, where it forms carbonic acid. The plants and animals that have

evolved over time to thrive in slightly alkaline surface waters—their pH is around 8.3—are now having to adapt to a 30% increase in the acidity of their surroundings. Some will no doubt flourish, but if the trend continues, as it will for at least some decades, clams, mussels, conches and all creatures that grow shells made of calcium carbonate will struggle. So will corals, especially those whose skeletons are composed of aragonite, a particularly unstable form of calcium carbonate.

Man's interference does not stop with CO<sub>2</sub>. Knowingly and deliberately, he throws plenty of rubbish into the sea, everything from sewage to rubber tyres and from plastic packaging to toxic waste. Inadvertently, he also lets flame retardants, bunker oil and heavy metals seep into the mighty ocean, and often invasive species too. Much of the harm done by such pollutants is invisible to the eye: it shows up only in the analysis of dead polar bears or in tuna served in New York sushi bars.

Increasingly, though, swimmers, sailors and even those who monitor the sea with the help of satellites are encountering highly visible algal blooms known as red tides. These have always occurred naturally, but they have increased in frequency, number and size in recent years, notably since man-made nitrogen fertilizers came into widespread use in the 1950s. When rainwater contaminated with these fertilizers and other nutrients reaches the sea, as it does where the Mississippi runs into the Gulf of Mexico, an explosion of toxic algae and bacteria takes place, killing fish, absorbing almost all the oxygen and leaving a microbial-dominated ecosystem, often based on a carpet of slime.

Each of these phenomena would be bad enough on its own, but all appear to be linked, usually synergistically. Slaughter one species in the food web and you set off a chain of alterations above or below. Thus the near extinction of sea otters in the northern Pacific led to a proliferation of sea urchins, which then laid waste an entire kelp forest that had hitherto sustained its own ecosystem. If acidification kills tiny sea snails known as pteropods, as it is likely to, the Pacific salmon that feed upon these planktonic creatures may also die. Then other fish may move in, preventing the salmon from coming back, just as other species did when cod were all but fished out in Georges Bank, off New England.

Whereas misfortunes that came singly might not prove fatal, those that come in combination often prove overwhelming. The few coral reefs that remain pristine seem able to cope with the warming and acidification that none can escape, but most of the reefs that have also suffered overfishing or pollution have succumbed to bleaching or even death. Biodiversity comes with interdependence, and the shocks administered by mankind in recent decades have been so numerous and so severe that the natural balance of marine life is everywhere disturbed.

Are these changes reversible? Most scientists believe that fisheries, for instance, could be restored to health with the right policies, properly enforced. But many of the changes are speeding up, not slowing down. Some, such as the acidification of the seas, will continue for years to come simply because of events already in train or past. And some, such as the melting of the Arctic ice cap, may be close to the point at which an abrupt, and perhaps irreversible, series of happenings is set in motion.

It is clear, in any event, that man must change his ways. Humans could afford to treat the sea as an infinite resource when they were relatively few in number, capable of only rather inefficient exploitation of the vastly deep and without as yet a taste for fossil fuels. A world of 6.7 billion souls, set to become 9 billion by 2050, can no longer do so. The possibility of widespread catastrophe is simply too great

## **Ship Emissions Linked to 60,000 Deaths Annually**

Particulate emissions from marine shipping may cause approximately 60,000 deaths annually, according to a study in the journal *Environmental Science & Technology*. The study, by James J. Corbett of the University of Delaware and colleagues, notes that the marine transport sector “contributes significantly to air pollution, particularly in coastal areas.” The authors report that, annually, ocean-going ships are estimated to emit 1.2 to 1.6 million metric tons of particulate matter, 4.7 to 6.5 million metric tons of sulfur oxides and 5 to 6.9 million metric tons of nitrogen oxides. Recent studies estimate that around 15 percent of global nitrogen oxide emissions and 5 to 8 percent of global sulfur oxide emissions are attributable to ocean-going ships. “Given nearly 70

percent of ship emissions occur within 400 km [about 250 miles] of land, ships have the potential to contribute significant pollution in coastal communities,” write Corbett and colleagues. Additionally, numerous studies have linked air pollution to human health impacts such as asthma and heart attacks. Indeed, an estimated 800,000 deaths each year worldwide are attributed to it. Corbett and his co-authors sought to ascertain how much of this mortality could be linked to ship emissions. They did this by first determining pollutant emissions from ships and applied atmospheric transportation and chemistry models to estimate what the increased concentrations were due to ships. They then could estimate increased risk to those populations exposed to these additional concentrations and calculate what additional mortalities could be due to that increased risk.

They concluded that exposure to shipping-related emissions resulted in 19,000 to 64,000 cardiopulmonary and lung cancer mortalities annually in 2002, and that those mortalities would increase by approximately 40 percent by 2012 because of trade driven growth in ship emissions. In other words, approximately 3 to 8 percent of all such mortalities each year are attributable to marine shipping. These mortalities were concentrated in distinct regions. Between 20 and 40 percent occurred in the European and Mediterranean region; 20 to 30 percent in East Asia, including China and Japan; and 15 to 30 percent in South Asia, including India and Indonesia. As expected, those regions reflect the areas where both shipping concentrations and coastal population levels are high. The authors further observe that although they concentrate on cardiopulmonary and lung cancer mortalities, regions where ships contribute most to mortality effects -- such as concentrated population areas with high shipping-related particulate matter Emission -- should be expected to suffer other related health impacts. They conclude that mitigating ship emissions from engine combustion and exhaust pollutants could result in significant health benefits.

**Source:** Corbett, J.J. *et al.* 2007. Mortality from ship emissions: A global assessment. *Environmental Science & Technology* **41**(24): 8512-8518.

**Contact:** James J. Corbett, College of Marine and Earth Studies, University of Delaware. E-mail: [jcorbett@udel.edu](mailto:jcorbett@udel.edu)

## **Global Map-based Analysis of Threats to World's Coral Reefs**

The World Resources Institute (WRI), the International Coral Reef Action Network (ICRAN) and the UNEP World Conservation Monitoring Centre (UNEP-WCMC), are leading a world-class collaboration in a global, map-based analysis of threats to the world's coral reefs, called Reefs at Risk Revisited. The update of this influential 1998 analysis, Reefs at Risk - a map-based indicator of threat to the world's coral reefs, will provide a detailed examination of human pressures on coral reefs, implications for reef condition and projections of associated economic impacts in coastal communities.

One of the activities under the Reefs at Risk Revisited project is to develop some interesting stories of both healthy and threatened reefs that highlight impacts and successes from around the world. The threatened reef stories will help to bring home points and provide memorable examples - examples where coastal development has caused problems; examples where runoff from agriculture has damaged the reef; examples where over fishing resulted in significant change in coral cover, locations of blast fishing, etc.

The healthy reef stories will serve to highlight those that are showing natural resilience, and others that showcase successful management interventions that have served to reverse the decline in coral reef ecosystems. The signs of promise are important to show all is not lost, and to provide some examples which give us hope.

Does your organization have stories that you would like to share? If you are able to identify a location that you are familiar with, or suggest individuals who may be able to provide a case study that would fulfill the above objectives, could you please contact Terri Young on [tyoung@icran.org](mailto:tyoung@icran.org).

Terri Young  
International Coral Reef Action Network (ICRAN)

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## **Meetings & Conferences**

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### **International Marine Conservation Congress - Making Marine Science Matter**

The IMCC will be an interdisciplinary meeting that will engage natural and social scientists, managers, policy-makers, and the public. The goal of the IMCC is to put conservation science into practice through public and media outreach and the development of science-based deliverables (e.g., policy briefs, blue ribbon position papers) that will be used to drive policy change and implementation.

#### **Major Themes**

- Global Climate Change
- The Land-Sea Interface
- Ecosystem-based Management
- Poverty and Globalization

Cross-cutting issues encompass topics of global relevance and importance to marine conservation that relate to the major themes.

#### **Cross-cutting issues**

- Marine Protected Areas
- Education, Outreach and Capacity Building
- Governance Arrangements
- Fisheries and Aquaculture
- Economics

We anticipate that cross-cut issues will result in proposals on a variety of sub-topics. Potential topics include but are not limited to: networks and system development, MPA and MPA network monitoring and evaluation, high seas impacts, ocean resource use and planning, international instruments and trans-boundary relations, human/animal impacts, ecological impacts of ocean acidification, technology, stakeholder involvement, indigenous issues, improving public ocean knowledge, incorporating traditional and local knowledge into decision making, and valuing marine ecosystem services.

This meeting will serve as the 2nd International Marine Protected Areas Congress (IMPAC2) and will maintain the scope and vision of IMPAC1 (held in Geelong, Australia in October 2005).

#### **CONFIRMED PLENARY TALKS:**

May 20: Dr. Daniel Pauly: Professor and Director, Fisheries Centre, University of British Columbia

May 21: Dr. Ratana Cheunpagdee: Canada Research Chair in Natural Resource Sustainability and Community Development, Memorial University

May 22: Dr. Rod Fujita: Senior Scientist at Environmental Defense in Oakland, California

May 23: Dorothy Childers: Program Director, Alaska Marine Conservation Council

Detailed information about the meeting, registration and abstract submission guidelines can be found at:

<http://www2.cedarcrest.edu/imcc/registration.html>

### **2009 Joint Assembly-The Meeting of the Americas.**

24–27 May 2009. Toronto, Ontario, Canada

The 2009 Joint Assembly is being held 24–27 May 2009 at the Metro Toronto Convention Centre, located at 222 Bremner Boulevard, Toronto, Ontario, Canada. The Program Committee is developing a Union-wide science program that will cover topics in all areas of geophysical sciences. With its diverse attractions, character, and international spirit, Toronto is the perfect setting for a productive meeting!

#### **Abstract Submissions**

Abstract submissions are now open for the 2009 Joint Assembly. Review the list of [session and submission instructions](#) before preparing your abstract.

#### **Registration Update**

Visit our [Registration Section](#) for information on field trips, short courses and workshops, and social events.

#### **Student Travel Grants**

AGU is now [accepting applications](#) for student travel grants to the 2009 Joint Assembly.

#### **Visa Information**

A **Letter of Invitation** may be needed for those who are applying for a Visa to attend the Joint Assembly.

Please fill out the following [questionnaire](#). If you qualify you will receive a letter via email as a pdf.

Visit [Citizenship and Immigration Canada](#) for up-to-date Visa Information for travel to Canada.

### Sponsors

[CGU](#), [GAC](#), [IAH-CNC](#), [MAC](#), [SEG](#), [MSA](#), [GS](#), [AGU](#)

## 34<sup>th</sup> Scientific Meeting of the AMLC

2009 – The 34<sup>th</sup> Scientific Meeting of the AMLC will be hosted by Sascha Steiner of the Institute for Tropical Marine Ecology, Inc. on the island of Dominica. The dates have been established as Monday-Friday May 25-29, 2009. The 2009 Executive Board Meeting is scheduled for Sunday, May 24<sup>th</sup> at 9:00 AM.

In conjunction with establishing on-line meeting registration and abstract submission, the AMLC has also established a new and more efficient mechanism for on-line Individual Member applications and for on-line credit card payment of Individual and Institutional membership dues.

From the AMLC website at [www.amlc-carib.org](http://www.amlc-carib.org), you may now click on "Membership Services," which will call up 4 choices: (1) "Join Us," (2) "Update Contact Info," (3) "Pay Dues: Individual," and (4) "Pay Dues: Institution." Each of these choices provides a form for inputting personal information (i.e. your name, etc.). At the bottom of the forms for joining or paying dues, you may click on the "Continue" icon, which will take you to Pay Pal to enable your paying dues with your credit card. A 5% service charge will automatically be added to your payment to cover costs of processing the credit card charge, just as it has always been.

We anticipate that this new system will make it much easier and less expensive for some of our members to transfer U.S. funds than in the past. Also, because from this moment we can no longer accept mail-in credit card payments, this on-line system will avoid your having to send sensitive private and credit card information through the postal system.

We wish to once again express my gratitude to Dave Zawada of the USGS in St. Petersburg, Florida, who

developed this on-line capability. It will make life easier for a lot of us! Thank you Dave!

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## Course Offerings

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### Bermuda Institute of Ocean Sciences

The Bermuda Institute of Ocean Sciences (BIOS) is pleased to announce a Coral Reef Ecology field course offering in Bermuda in July 2009.

**Course dates:** 12 July to 1 August, 2009

**Course instructor:** Dr. Samantha de Putron, BIOS

**Qualifications:** Open to undergraduates and graduate students with strong academic credentials, and to teachers and professionals. The course is open only to SCUBA divers.

**Application deadline:** March 13, 2009 for first round of admissions and scholarship decisions. Later applications will also receive consideration on a space-available basis.

Scholarships and financial aid AVAILABLE and are based on academic background/performance and demonstrated need. Full scholarships are rare and only available in exceptional circumstances. We encourage students to apply for other sources of funding that BIOS can supplement or match. Travel and SCUBA equipment are NOT included under any circumstance. Some scholarships and financial aid are open to all nationalities. We particularly encourage Canadian and UK students to apply, as there are specific funding sources for these students.

More information of the Coral Reef Ecology summer course is below and also can be found at: [http://www.bios.edu/education/coral\\_reef\\_ecology.html](http://www.bios.edu/education/coral_reef_ecology.html)

Application form available at: <http://www.bios.edu/education/scapp.html>

For further information please contact: [education@bios.edu](mailto:education@bios.edu)



**Course summary:**The Coral Reef Ecology summer course at BIOS exposes the student to the reef ecosystem at all organizational levels, from physiological ecology through population biology, community structure to ecosystem dynamics, and ends with consideration of human impacts and climate change. The course has a large practical component, and the field surveys along with complementary laboratory analysis provide training in many techniques commonly used in coral reef research. The integrated course is comprised of lectures, required reading, laboratory exercises and field surveys. The lectures cover a broad range of relevant topics in coral reef ecology that are supplemented by readings from the primary literature with attention given to active areas of research. The course is divided into 20 lectures (1 to 1.25 hours long), 9 field trips (4 hours each), 6 lab sessions (4-5 hours each), 6 precepts (1 hour each), 3 or 4 seminars by BIOS scientists on current research, a take home written exam, and an afternoon of oral presentations. An additional 10-15 hours is taken to complete the working-group analyses and presentations.

The lab work is focused on training in practical techniques:

- separation of coral tissue from skeleton
- fractionation by centrifugation
- enumeration of zooxanthellae with a haemocytometer
- chlorophyll analysis
- determination of coral surface area
- coral growth determination using a buoyant weighing technique

Various field techniques and subsequent lab analyses are used repetitively at different sites so that each student has the opportunity to become familiar with the following methods:

- video-taping of reef transects to assess community structure
- quantification of reef fish community structure using a visual census method
- quadrat sampling of reef algae, sorting, identification and dry weight biomass estimation
- quadrat sampling and measurement of juvenile corals to construct size/frequency curves
- quantification of parrotfish and surgeonfish feeding rates and social interactions

The laboratory and field work are synthesized as final oral presentations that are based on a typical format for presenting scientific results to an audience and so

are designed to provide experience in communicating science.

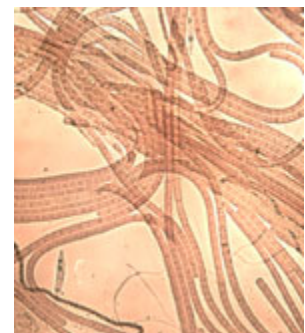
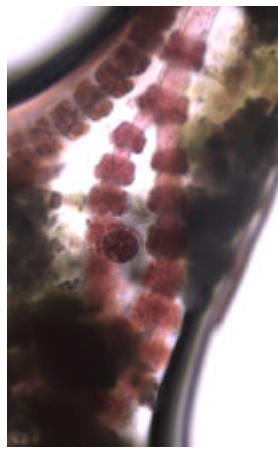
## **Coral tissue slide-reading workshop (July 26-31, 2009)**

For professional scientists and graduate students interested in the histology or microscopic anatomy of scleractinian corals, gorgonians, and other Cnidaria.

**Instructor:** Esther C. Peters, Ph.D., George Mason University

This 5-day workshop focuses on the histology or microscopic anatomy of scleractinian corals, gorgonians, and other Cnidaria to support studies on their ecology, physiology, reproduction, biochemistry, systematics, molecular biology/genetics, immunology, embryology, and pathology. Topics covered include histology; diseases; sample collection, preservation, processing, and histoslide preparation (lecture and discussion only, no laboratory); and interpretation of tissue sections from healthy and diseased specimens using light microscopy. Participants can bring histoslides from their own research to share with the group and discuss with Dr. Peters.

Lectures alternate with individual and group slide reading sessions using the laboratory's 4 student microscopes and Olympus with imaging capabilities. Students may also bring their own laptops (other computers will also be available) to learn how to access the Coral Disease and Health Consortium's virtual slide collection. Two half-day field trips to snorkel or dive at Looe Reef are also included. This course will be limited to 8 individuals.



**Prerequisites:** College-level biology courses are required, and courses in invertebrate zoology, microbiology, ecology, chemistry, biochemistry, physiology, histology, or marine sciences will be very helpful. SCUBA certification is required for those wishing to dive, and applicants will need to meet Mote's standards for "temporary diver" status. You need to clear your dive status with MOTE.

**Costs:** The course fee of **\$1000** includes all course materials, accommodations, meals (dinner, 7/26 through breakfast on 7/31), boat costs, SCUBA tanks and weights. Participants need to arrange travel to and from the facility, and should bring their own mask, snorkel, fins, and weight belt, as well as a regulator and BCD(if diving). Equipment rentals can be arranged if required. With advanced notice, pick up and drop off at the Key West International Airport may be arranged.

### **Key Dates**

10 April, 2009 - Application receipt deadline

24 April, 2009 - Notification of acceptance

25 May, 2009 - Deposit (\$300.00) due

26 June, 2009 - Balance (\$700.00) due, or last day to withdraw with deposit refund

26 July, 2009 - Course starts

(plan to arrive by 4 p.m. EDT)

Download application forms from these sites. Questions about the courses should be directed to Dr. Esther Peters ([epeters2@gmu.edu](mailto:epeters2@gmu.edu)), about registration to Stillwater Research Group ([SRG@delta-seven.com](mailto:SRG@delta-seven.com)), and about the diving program to Erich Bartels ([ebartels@mote.org](mailto:ebartels@mote.org))

## **Institute of Marine & Coastal Sciences, Rutgers University – Summer programs - 2009**

**Tropical Marine Conservation - July 19 - August 07, 2009**

4 Undergraduate or Graduate Credits from the Institute of Marine & Coastal Sciences, Rutgers University.

This program provides a research internship framework that involves marine ecology and conservation principles. Participants conduct coral

reef ecosystem field research with a principal investigator.

As part of 10 years of active research by the Central Caribbean Marine Institute (CCMI), students are engaged in data collection at one of the world's most beautiful coral reefs surrounding Little Cayman and the Bloody Bay Marine Park. CCMI invites students to help in this important work to understand the major declines in reef communities and to become aware of conservation practices. The program goals are to enhance student research training, increase the interest in coral reef science and conservation, and to provide useful data to assist CCMI in our long-term ecosystem research.

Students prepare for marine conservation research by learning principles of sustainability, essential theories of marine protection and management, and by reviewing case studies. Students work in teams on field research projects that explore the successes and failures of marine protection and complete a joint research poster that may be published or presented at a national or international conference.

**Application deadline:** March 1, 2009

Admission is rolling and spaces do fill up. Applying early is best. To learn more and to see The Little Cayman Research Centre <http://www.reefresearch.org> <<http://www.reefresearch.org/>>

### **Destination Setting**

Students work and live at the Little Cayman Research Center. This new field station, which overlooks the Caribbean Sea, has dormitory style rooms, three flowing sea water laboratories, large classroom and is equipped for biological and ecological studies,. We serve three full meals each day. Our bath house is the first model of sustainable development for the Cayman Islands. Little Cayman is consistently ranked as the best diving destination in the Caribbean because of the stunning reef walls, shallow reef structures, and large undersea life, including sea turtles and the endangered Nassau grouper.

### **Registration and affiliated University:**

Undergraduate and graduate course credit is offered through the Rutgers University Institute of Marine & Coastal Sciences and the Rutgers Study Abroad

(Cayman Islands) program. All registration requirements and payment for this course must be processed through Rutgers Study Abroad program.

**Contact:** Students may also email Rutgers at [RU\\_Abroad@email.rutgers.edu](mailto:RU_Abroad@email.rutgers.edu) or call 732-932-7787. Additional course information can be requested from CCMI's education officer at [ccmiapplications@reefresearch.org](mailto:ccmiapplications@reefresearch.org).

SCUBA Divers are encouraged to apply but non-certified participants are also accepted.

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## ***New Books***

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### **Reef Restoration: Concepts and Guidelines**

Simple advice on coral reef restoration for coastal managers, decision makers, technical advisors and others who may be involved in community-based reef restoration efforts. If you are involved in reef restoration it is important to be aware that there is still much uncertainty in the science underpinning restoration, not least due to the great complexity of reef ecosystems. Through the Coral Reef Targeted Research and Capacity Building for Management (CRTR) Program, much scientific research is currently underway world-wide to address these knowledge gaps, and improve our understanding of what reef restoration interventions can and cannot achieve. Despite these uncertainties, there are many useful lessons to be learned from previous work. *Reef Restoration: Concepts and Guidelines* seeks to summarize such lessons in a succinct form for practitioners to help identify what works, what doesn't and what new techniques are on the horizon to enable goals and expectations to be set accordingly.

For more information contact: Dr. Alasdair Edwards, Chair, CRTR Restoration and Remediation Working Group on [a.j.edwards@newcastle.ac.uk](mailto:a.j.edwards@newcastle.ac.uk)

### **Marine Biodiversity of Costa Rica, Central America**

Ingo S. Wehrtmann and Jorge Cortés (Eds.)-2008

CIMAR and Escuela de Biología, Universidad de Costa Rica, Costa Rica

This volume, compiling and updating the marine biodiversity information of Costa Rica, consists of species lists, and comments on the state of knowledge of most taxonomical groups. It contains information about collections and experts for each taxonomic group as well as information gaps, thus serving as a starting point and basic reference for future research. Although focusing on Costa Rica, the book provides an overview of marine species diversity of Central America. This full color book with over 100 color illustrations should stimulate marine research in the region, and will be an asset for students and researchers as well as decision makers and conservation managers dealing with the sustainable use of marine and coastal areas.

### **From the foreword by the President of Costa Rica**

**Oscar Arias Sanchez:** 'The work of Ingo Wehrtmann, Jorge Cortes and their colleagues, who have created the first-ever compilation of knowledge of our marine organisms, allows the rest of us to imagine underwater life a bit more clearly. Such imagining is crucial if our marine habitats are to be saved. This work also underscores the urgency of our task as conservationists.'

550 p. 118 illus. in color., Hardcover Monographiae Biologicae, Volume 86 - \$ 149.00

### **Coral Disease Handbook, guidelines for assessment, monitoring and management**

L. Raymundo, C.S. Cough and D. Harvell (Eds), 2008.

Produced by the Disease working group of the GEF-WB Coral Reef Targeted Research and Capacity Building Project, this book compiles all the experiences researchers have gathered during several years of field work with coral reef diseases.

The manual is intended for researchers, managers and students alike and presents a general introduction to infectious diseases in corals-what they are, why they are a growing problem, and what is currently understood about them. It also presents a look at the current global patterns and hotspots in regard to coral diseases, decision trees for disease and other health

problem identification, extensive discussion on field protocols, assessments, measuring disease dynamics and impacts, the role of global sea water warming and decreasing water quality, and management issues and potential actions.

The manual and two sets of comprehensive underwater ID cards for both the Indo-Pacific and Atlantic-Caribbean coral reef diseases can be purchased from CRTR program at the University of Queensland, Australia. [info@gefcoral.org](mailto:info@gefcoral.org) and [www.gefcoral.org](http://www.gefcoral.org)

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## Change of Address

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MOVING? To ensure that you continue to receive *Caribbean Marine Science*, notification of upcoming AMLC meetings and other AMLC information, please fill out the following change of address form and mail it to the address below, or send the information by e-mail to David Wilson at the e-mail address below.

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Name & Title \_\_\_\_\_

Institution/Association \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_

FAX \_\_\_\_\_

E-mail \_\_\_\_\_

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## Dues

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Individual membership dues for 2009-10 are \$25.00 due in June 2009. You can make your payment with Dr. David Wilson, AMLC's Membership Director, who can be contacted by e-mail at: [davetroywilson@gmail.com](mailto:davetroywilson@gmail.com). You may also help AMLC with a donation membership contribution if you wish; the schedule for these is presented below. Student dues are still \$5 per year.

**The AMLC can accept on-line credit card payments (Visa, MasterCard or American Express) for AMLC dues.** We formerly accepted credit card charges by mail, but because of several logistical problems, we now accept credit card payments ONLY on line at [www.amlc-carib.org](http://www.amlc-carib.org). Once on this site, go to "Membership Services" for the simple instructions on making your credit card remittance. A 5% service charge will be added to credit card payments. We still accept checks by mail, however. Checks must be in U.S. dollars, from U.S. banks (or a U.S. dollars bank draft), made out to "AMLC", and sent to Laurie Richardson (address on next page).

Name & Title \_\_\_\_\_

Institution/Association \_\_\_\_\_

Billing Address \_\_\_\_\_

Telephone \_\_\_\_\_

FAX \_\_\_\_\_

E-mail \_\_\_\_\_

Scientific interests \_\_\_\_\_

Membership Options: Student (US\$5.00) \_\_\_\_\_

Regular (US\$25.00) \_\_\_\_\_ Sponsor(US\$30.00) \_\_\_\_\_

Sustaining Member (US\$50.00) \_\_\_\_\_ and

Patron (US\$100.00) \_\_\_\_\_.

My check (bank draft) is enclosed for US\$ \_\_\_\_\_.

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## AMLC Background & Goals

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*The Association of Marine Laboratories of the Caribbean (AMLC)* was founded in 1957 by marine researchers with interests in the marine science of the tropical Atlantic and Caribbean. Founded primarily as a scientific organization, the strength of the AMLC lies in the diversity of its member laboratories and the extensive expertise of its membership. Institutional, individual scientist and student memberships are available.

Biannual AMLC scientific meetings are hosted by member laboratories actively conducting marine research in the Caribbean. The host laboratory arranges facilities for research presentations, and logistical arrangements. The AMLC has no designated official language so researchers are free to make their presentations in their native language.

**Caribbean Marine Science**, published twice per year in English and Spanish, is the newsletter of the AMLC and informs members of AMLC activities, pertinent events, and relevant research.

The purpose of the AMLC is to advance common interest in the marine sciences by:

- a. Assisting and initiating cooperative research and education programs
- b. Providing for a for exchange of scientific and technical information
- c. Fostering personal and official relations among members
- d. Publishing the proceedings of scientific meetings and a newsletter

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Office Vacant

### Information Officer

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**Contributions to the AMLC Newsletter:**

All members of the AMLC (individual and laboratory) are encouraged to send relevant news items at any time to the newsletter editor. Relevant news items include, but are not limited to: new facilities, faculty/staff changes, positions available, research programs and initiatives, publications of general interest, awards, visiting scientist opportunities, and education programs. Submitted items should be sent to the AMLC newsletter office by the end of February for inclusion in the Spring issue, and by the end of September for the Fall issue.

**Please send your information and comments to:**

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