

INSTRUCTOR'S MANUAL: PLANNING A FIELD COURSE



*Preserving Roatán's
natural resources
through education
and research.*

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Roatan Institute for Marine Sciences

*The Roatán Institute for Marine Sciences (RIMS) was established with education in mind and academic groups are invited to utilize our facility to gain first-hand knowledge of tropical marine ecosystems. This may be the first encounter with coral reefs for many students and the underwater world of Roatán provides an incomparable realm of beauty, excitement and endless opportunity for study. A field course at **RIMS** allows students to travel abroad, become immersed in a new culture, and experience the simple way of life that has existed for hundreds of years on this small Caribbean island.*

*What makes the **Roatán Institute for Marine Sciences** so unique? The rich waters of Roatán abound with stories. Tales of life, death, growth and change are all waiting to be told. More importantly, they are waiting to be heard. The stories begin with the reef. Miles of coral, seagrass beds, mangroves and sandy beaches set the scene. The starring roles are the fish and other organisms that call these habitats home. **The Roatán Institute for Marine Sciences** knows these stories. After all, they unfold right offshore. Keep reading. The following pages will tell you about the unique opportunity **RIMS** has to offer. It's not just another Caribbean Marine Laboratory!*

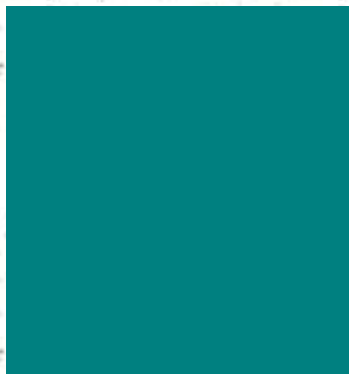
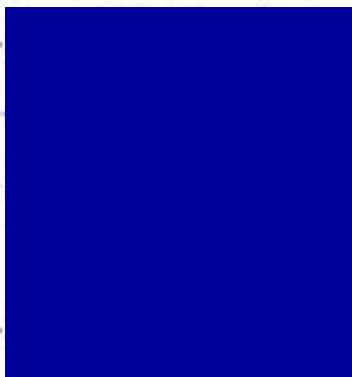




Roatan Institute for Marine Sciences

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The Roatán Institute for Marine Sciences

*The Roatán Institute for Marine Sciences (RIMS) is ideally located on the northwest coast of Roatán where over 30 miles of fringing and barrier reefs, seagrass beds, mangroves and shoreline are home to an astounding profusion of life. The facility was founded in 1989 with the primary objective of preserving Roatán's natural resources through education and research. In almost two decades, RIMS has established itself as a dedicated teaching institution. Our facility is visited throughout the year by colleges, universities and high schools from abroad to study tropical marine ecosystems and the bottlenose dolphins (*Tursiops truncatus*) we house at our facility. Many courses are for academic credit, some are run in conjunction with other field research stations, and others are simply introductory classes to the ecology of Caribbean coral reef systems.*

The main complex of our facility consists of the Education Center, the dry laboratory, and the Roatán Museum. The Education Center is designed for use as a comfortable and spacious classroom. This room houses exhibits on the coral reef, fish, invertebrates, reptiles, birds, and geology of the Bay Islands. When classes are not in session, the center is open to the public and visited by hundreds of people annually. The classroom is connected to a well equipped dry lab, while the wet laboratory and gear room can be found directly adjacent to the main complex. In 1992, the Roatán Museum became the newest addition to the RIMS complex. The museum educates visitors and locals about the rich cultural heritage of Honduras with particular focus on the Bay Islands

Our approach to education at RIMS is "hands-on". Instruction is geared toward spending as much time as possible in the marine environment. By far, the most effective educational tool we offer is the reef itself. Several dive boats will be at your service to provide access to different locations along our well-developed reef system. Our full service dive operation can supply you with the tanks and gear so you may spend as much of your trip where you should be...underwater. While our primary focus is the marine environment, RIMS can also facilitate the study of cultural interests and tropical terrestrial interests including island geology, botany, ornithology and ethnology.



Students are housed in accommodations provided by Anthony's Key Resort (AKR). This renowned dive resort has been in operation for nearly 50 years and extends its comforts to the student groups. AKR consists of private cabins, SCUBA shop and service station, photo shop, gift shop, open dining area and on-site hyperbaric chamber and medical clinic. Everything your group might need is within easy access. The proximity of living and working conditions is ideal and maximizes the effectiveness of the program.

Research is another important aspect of our facility. RIMS has initiated a long-term reef monitoring study to assess changing reef conditions. Surveys of coral, fish and invertebrate populations, and water temperature monitoring are all part of this project. While student groups are invited to participate in our reef-monitoring program, we also accommodate faculty and students pursuing independent research.

RIMS wants to make your experience at our facility the best it can be. In order for our staff to accommodate your academic needs, we ask that you arrange your schedule with the Education Coordinator of RIMS prior to your arrival. We can help simplify the process of organizing and planning your course so that you can invest your time in teaching rather than worrying about logistics. Please contact RIMS for further information regarding program availability, scheduling, and research permits.

Attention:

Jennifer Keck

**Education & Research Coordinator
Roatán Institute for Marine Sciences
Roatán, Honduras, Central America**

Ph: 504-2407-2244 or 2245 or 2246 or 2247

Website: <http://www.roatanims.org>

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For reservation and booking information please contact our U.S. office at:

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RIMS Facilities



The Education Center: The spacious classroom is equipped with LCD projector, video and audio equipment, slide projector, overhead projector, chalkboard and dry erase boards. This air-conditioned room easily accommodates 40 people.

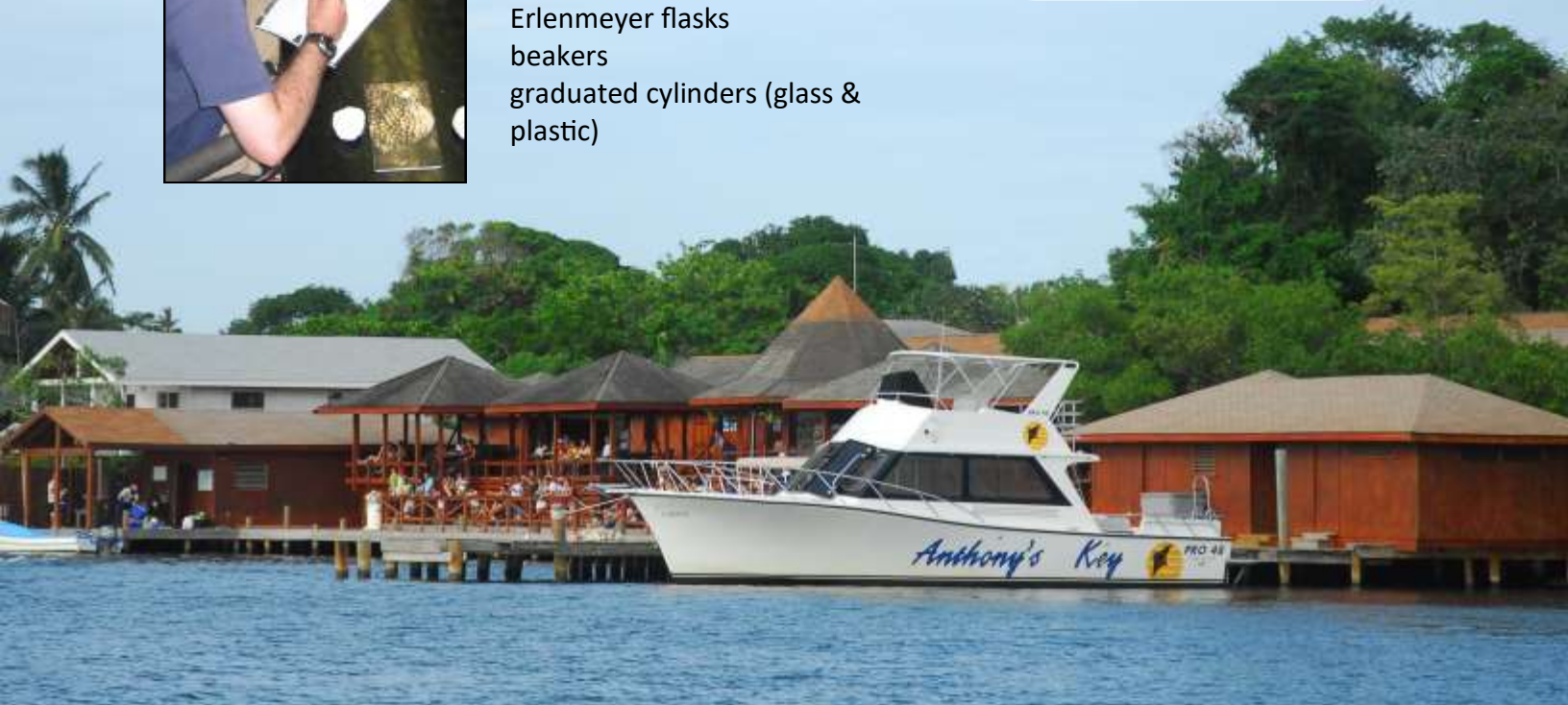
Dry Laboratory: The dry laboratory is adjacent to the RIMS classroom and is equipped with ample counter space and running water. A reference library contains field guides, marine related books, reprints and a collection of slides that are available for use by your class. We also have several specimen collections including sponges, corals, algae, seashells, and insects found on Roatán. Listed below is equipment*



- 6 dissecting scopes
- 6 compound microscopes
- slides, cover slips, depression slides
- forceps
- glass petri dishes
- plastic sample bottles (250 & 500 ml)
- pressure sterilizer
- hand held thermometer
- hot plate with stirrer
- glass specimen dishes
- vacuum filter apparatus
- light table
- Erlenmeyer flasks
- beakers
- graduated cylinders (glass & plastic)



Chemicals: Formalin, alcohol, distilled water and various reagents are available. All researchers bringing chemicals of any kind to RIMS must make arrangements to carry them back.



Wet Laboratory: The wet lab is adjacent to the main building. It is equipped with a 20-ft flow-through seawater table for marine investigations. Small aquaria are on hand to isolate marine organisms. The lab is also equipped with ample counter space and running water. A separate storage room for research and scuba gear is located in this complex. Below is a list of equipment maintained in this lab.



underwater dive slates	30
waterproof fish I.D. cards	20
hand nets	12
secchi discs	1
plankton nets (40um & 300 um)	
1 meter quadrats	3
1/2 meter quadrats	2
30 meter underwater tape	4
tide gauge	
air temperature monitor	
10 gallon aquariums	2
20 gallon aquariums	4
air stones	
hand corer	

** Please inquire prior to your arrival whether equipment you will need is available. Several reliable shipping companies can transport additional personal equipment to our facility. Shipping information can be provided upon request.*

RIMS Dock and Boats: Several boats are available for student groups. Our 42-foot dive boats have a 20 passenger capacity. A competent captain and at least one dive master will accompany each group on every outing. The dive boat is equipped with a radio, a First Aid kit, emergency oxygen kit, water tub for photo equipment and a cooler of drinking water. RIMS maintains a dockside rinse tank and a freshwater shower.



Roatán Museum: In 1992, Miss Cheryl Galindo founded the Roatán Museum. This museum is housed in the same complex as the Education Center and possesses one of the best collections of pre-Columbian artifacts in Central America. This museum chronicles the cultural and archeological history of the Bay Islands through text, maps, artwork, and artifacts including clay pottery, copper beads, and jade ornaments of the Payan Indians. Admission is free. Open daily from 8:00 AM to 5:00 PM.



Resort Facilities

Anthony's Key Resort (AKR) has been in operation for over 50 years and is renowned in the diving community. The resort is nestled on the northwest coast amidst lush tropical vegetation. Fifty-six private cabins are spread over a secluded island and verdant hillside. The unobtrusive physical setting of the resort creates a relaxing, stress-free environment while still providing many of the amenities of home. Listed below are some of the services that will help your stay be as comfortable as possible.

Accommodations: Students are housed in hillside bungalows overlooking the lagoon and reef. AKR generates its own power to provide 24-hour electricity (110V). Each room has a ceiling fan, private bathroom, hot water shower, and porch with hammocks. Each bungalow can accommodate up to four students. Spacious decks with hammocks make great meeting spots. Rooms are not co-ed.



Meals: Three meals a day are provided in your package. Most meals are served in the Anthony's Key Resort dining area. Meal times are as follows: breakfast 7:00 - 10:00 AM, lunch 12:00 - 2:00 PM, and dinner 6:00 - 9:00 PM. A typical meal consists of fresh fruits and vegetables, rice or pasta, and choices of beef, fish or chicken. Please inform us prior to your arrival if any member of your group will require a special diet and we will work to accommodate your needs.

PADI 5-Star Instructor Development Center: Students can become certified to dive during their visit. A full range of dive courses is offered at AKR including Open Water, Open Water referrals, Advanced, Rescue, Divemaster and over one dozen specialty courses. Certification courses can be arranged in advance. (See *Diving Options and Rates* on p. 75)



Aerial view of RIMS and Anthony's Key

"Photo Roatán": A full service photo shop is located next to Seaside Gifts. Camera batteries and dive light rentals are a few of the services they provide. Custom UW or topside videos of students can also be arranged. Please let us know prior to your arrival so that we may guarantee the availability of the photo staff. Purchases can be charged to your room. Open 7:00 AM to 5:00 PM daily.

Chamber and Clinic: While our commitment to safety is reflected in our excellent safety record, it is nice to know that medical facilities are at hand. The Cornerstone Recompression Chamber and Clinic is located on the resort at the far west end of the dive dock. This walk-in medical facility has been in operation since 1989 and offers low cost services to the local community. In addition, the facility houses a 54" hyperbaric chamber. The clinic extends its services to the student groups who may require minor medical attention or in an unlikely event need treatment in the hyperbaric chamber. Doctors on staff are extremely experienced at dealing with problems associated with diving and travel to remote tropical areas. There is a small visitation fee which can be charged to your room and prescribed medicine will also incur an additional charge. While the hours of operation are from 8:00 AM to 5:00 PM, the doctors are on call 24 hours for emergency medical services. Chamber tours are available if your group might be interested in hyperbaric medicine. Prior arrangements are necessary.



Sea Side Gift Shop: The new gift shop is located at the end of the dive dock and in front of the Scuba School. It offers one of Roatán's most complete selections of merchandise. Many Honduran crafts, leather goods, clothes, jewelry, books and cards are available and can be charged to your room. Open 7:00 AM to 6:00 PM daily.

Dock Snack Shop: The snack shop is located on the dive dock and offers snacks and beverages between diving and meals. Toiletries and other forgotten essentials may be purchased here as well. Retail diving equipment, guidebooks, logbooks, fin-straps, masks, wetsuits, BCDs, regulators and other dive necessities are available. Purchases can be charged to your room. Open 7:00 AM to 5:00 PM daily.

Swimming Pool & Bar: The pool is located in the center of Anthony's Key and is open from 8:00AM to 10:00PM daily. The bar offers a full drink list and snack options and is open from 10:00 AM until 6:00 PM. All orders can be charged to your room. Hot coffee is available 24 hours as well.



Water sports: Across the lagoon, on Anthony's Key, kayaks and paddleboards are available for use and are free of charge. We kindly request that they are kept inside the lagoon and are not taken outside of the channel.



Horseback riding: Horses are available for island exploration. Guided rides along the beach through the community of Sandy Bay leave twice a day. Departure times and sign up sheets are located at the front desk. 10-person limit per trip. The cost is \$25.00.





Students are housed in hill or dockside bungalows overlooking the lagoon and reef. Each room has a ceiling fan, 24-hour electricity and a bathroom with a hot water shower. Three meals a day are provided. Rates are based on 4 students per room and are available to educational groups participating in a structured scientific program.

SERVICES INCLUDED:

- 2 boat dives per day, limited shore diving & one night dive per week
 - One dolphin swim per student
- Lectures offered by RIMS staff on a variety of marine topics
 - Dry and wet laboratories
- A large air-conditioned classroom with audio/video equipment
- A 42-foot dive boat with captain, divemaster and UW naturalist
 - Use of tanks, weights and belts
- One half-day cultural or science related bus trip per week
 - Specimen collections and reference library
 - Admittance to the Roatán Museum
 - Waterproof marine identification guides
- Onsite clinic & recompression chamber with doctors on call 24-hours
- Recreational services and facilities offered at Anthony's Key Resort
 - Use of kayaks and paddleboards
- Ticket confirmation for departure
- Escorted round-trip transfer from airport to RIMS

PLEASE INQUIRE ABOUT CURRENT RATES

Map of Facilities



A Bailey's Key	M Frangipani Bar
B Snorkeling Area	N Sunset Viewing Deck
C Shore Dive Facilities	O Clubhouse
D AKR Pool Bar	P Land Taxi & Bus Stand
E Swimming Pool	Q Guest Gear Storage
F Key Pavilion	R Dive Shop
G Ixora Spa	S Snack Shop
H RIMS Registration	T Seaside Gifts & Photo Shop
I Roatán Institute for Marine Sciences & Roatán Museum	U SCUBA School
J Business Office	V Horseback Riding Hitching Post
K Reception & Lobby	W Recompression Chamber & Clinic
L Dining Room	X Kayaks & Paddleboards

Staff Directory

The Roatán Institute for Marine Sciences and Anthony's Key Resort employ over 200 staff members. All of them are dedicated to making your stay here as thoroughly enjoyable as possible. Hopefully you will get a chance to know some of them more than the introduction offered here.

Education and Research Coordinator

Jennifer Keck has been working as the Education Coordinator for nearly 20 years and she will be the first person you have contact with, often months before your arrival. One important aspect of her job is to coordinate your activities and help with the logistics of your trip so that you may concentrate on developing the curriculum. Most professors, even those returning, find her help and expertise invaluable. Depending on your needs she can assist you with some or all of the following:

1. Developing a course itinerary and arranging boat and classroom times. This should be done prior to arrival
2. Providing lectures to your class on a variety of topics.
3. Serving as a naturalist, assisting your class in keying out organisms, developing independent research projects and providing important information on the local marine environments
4. As a certified SCUBA Instructor, she will accompany your class on all field trips. Dive profiles will be discussed and important reef features will be pointed out.



Director of RIMS

Eldon Bolton, the Director of RIMS, was instrumental in the establishment of this facility and has been here since the facility opened its doors in 1989. He is involved in every aspect of its operations. He is in charge of the management, care and training of the bottlenose dolphins we house at our facility and oversees the education department and the research projects that are in operation.

Dolphin Staff at RIMS

A dedicated and professional staff is directly involved with the care, maintenance, training and research of our resident bottlenose dolphins (*Tursiops truncatus*). The efforts and tremendous energy of these devoted individuals are vital to the success of our facility and provide the animals with a healthy and stimulating environment. The amount of interaction, education and possible observational studies involving these marine mammals can be discussed with the Education Coordinator when planning your itinerary.



Resort Management and Staff

Anthony's Key Resort is owned and managed by the Galindo family and has been in operation since 1969. Julio Galindo Sr. (Don Julio) was born and raised on Roatán and his accomplishments far exceed the well run 5-star dive resort that he has managed for over 35 years. Don Julio and his family have been active in the political, environmental and social aspects of the Bay Islands for many years. Shortly after Don Julio began his involvement as manager of AKR he was elected mayor of Roatán, a position he served for 4 years. He took a break from politics after becoming sole owner of the resort and under his direction the resort underwent several large expansions. One of these expansions included the establishment of RIMS in 1989.



Julio Galindo



Samir Galindo

As a strong advocate for education, research and conservation Don Julio has said, " ...we can no longer take it for granted that our reefs, lagoons, forests and the life they support can absorb without damage the development the island will inevitably experience. Opportunities for systematic study and research of our habitats should be offered. It is imperative that we preserve what we have." It is this active interest in the quality of life and environment of the island that put Don Julio back into the political arena once again. In 1990 he was elected Senator of the Bay Islands and was also appointed as Chairman for the Development of the Bay Islands. While he is no longer formally active in politics, he is still very much involved in the community.

His wife, Cheryl Galindo, is also an active member of the community. With the guidance and expertise of the Honduran Institute of Anthropology, Mrs. Cheryl created the Roatán Museum in 1992, which is housed in the RIMS facility. She also served as the head of the board of directors for the Bay Islands Conservation Association (BICA), a non-profit environmental organization, and is the founder of the Bilingual School in Coxen Hole (ESBIR). Don Julio's son, Samir and his wife Joni, now manage the resort while his daughter Haydee, oversees Bahia Tours, the resort's Florida-based reservation office. Samir & Joni supervise all of the resort's operations. Assisting them is a dedicated staff of office workers, dive staff, boat crew, cleaning team, kitchen staff, grounds men, repair crew, and security. The staff is extremely friendly and courteous and a great source of information and stories about island living.

Advisory Board and Visiting Faculty

In 1991, RIMS established an advisory board composed of experienced professors, research biologists and technical consultants. This team of diverse professionals has continued to monitor the improvements and advancements made at our facility over the past 17 years. The advisory board was also instrumental in designing the protocol and methodology for the long term monitoring program that has been in operation for over a decade. Several members have maintained extremely close ties with our facility. These adjunct faculty members visit regularly and provide technical support and advisory assistance with the monitoring project and education and research programs.



Planning a Course at RIMS

The Roatán Institute for Marine Sciences is dedicated to teaching people about the marine environment by providing opportunities to work directly in the field. The following pages address a few of the questions that arise when developing a course.

Who should you bring?

There are many ways to take advantage of the marine habitats of Roatán and educational groups of all kinds are encouraged to utilize our facility. RIMS extends its facility to undergraduate marine biology majors, graduate students in marine biology or geology, non-science majors, secondary and elementary school teachers interested in continued education and even high school students. Just because we use the word “student” it does not mean that the group needs to be enrolled in a formal class. The programs we offer can be provided to adults who are interested in tropical marine biology with no formal marine science background. It is up to you to recruit the students. Perhaps your university or college offers a coral reef ecology, marine geology or tropical ecology course in which a trip to Roatán can be incorporated into the curriculum as the field or lab component. Perhaps your school offers general marine biology courses and you can incorporate this into the curriculum as “an introduction to tropical marine ecosystems”. Maybe your school does not offer a marine biology course but encourages international travel and education aboard. What about a group of graduate students pursuing independent research projects? Every year we have students that fit into each of these groups.

When do you come?

Most groups arrange their trips around school breaks and vacations. Because breaks are often the same for most groups these time slots are highly coveted and it is recommended that you reserve your spot early. Summer break is our busiest time for visits, as the trip is less likely to interfere with other courses. Ideally we attempt to schedule groups so that only one class is here to utilize our facility at a time. The personalized services we are able to offer in doing so, as well as the sole attention provided by our staff and complete disposal of our resources has helped us form many long-term relationships with many visiting universities.

How long do you stay?

Most student groups stay from one to two weeks. Graduate students often stay for longer periods of time. Our student package rates are based on a one-week stay. Shorter stays are discouraged. When travel time is factored in this would leave very little actual program time.

Receiving credit?

The issue of credit is a logistical matter to be arranged with your institution. There are several options involving credit that you can choose from depending on how intensive your curriculum is and how much you hope to accomplish.

One option is to offer a course at your university with a visit to RIMS as a substitute for the lab portion of the class for 1 or 2 credits. By working around school breaks and vacations, classes at home would not be missed. Keep in mind that if you ask students to sacrifice their “Spring Break” they might not be so inclined to take tests, do reports and sit in a lab. That’s OK at RIMS. We guarantee they will still walk away with a wealth of knowledge; it just won’t be acquired the old-fashioned way.

Another option is to offer an intensive 2 to 3 week course (ideally as a summer course), which would receive a full semester or quarter credit depending upon your school's system. Each day at RIMS would involve from 5-8 contact hours of instruction, fieldwork and lab-work. A typical four-credit 15-week course in a semester involves 30 hours of lecture and 45 hours of field/or laboratory work. It is quite easy to offer an intense 2-week course at our facility that will not only cover the curriculum of the 15 weeks but will plunge you into the actual environment.

There is no better way to learn marine biology than to study the coral reefs, their ecology and their interconnectedness with other tropical biotic communities found on our island. Sound enticing? Please remember that credit or no credit, the experience is rewarding on many levels.



What will you teach?

The most difficult part of the planning process may be the challenge of designing a course that can “cram” into one week what some people dedicate their entire lives to studying. We want to assist you in planning a course to incorporate all of your interests. Whether you desire to bring a group of undergraduates, graduate students, high school students, or even teachers, the Education Coordinator can provide you with assistance in developing your course curriculum.


Your first thought may be how the students can be expected to engage in an educational course when the “field” is a “tropical paradise” of sandy beaches, swaying palms, and warm, crystal clear water? By combining lecture, both in class and in the field, with direct investigation of the environment, we hope to foster an enthusiasm that is fueled on knowledge. Group or individual projects that require students to use the scientific method to propose hypotheses, collect data, and compile research reports is one way to go about the course. Tests, lectures, and labs are another way. You can even make the foundation of the course to be the identification of the marine organisms.

As the instructor or group leader it is not essential that you have any training in Caribbean-based marine biology. Our staff members can provide instruction and lecture material. A list of references has been provided which can augment your marine science background prior to your arrival (see *Suggested Reading Material* p. 76). In addition, suggestions for activities that students have performed in the past have also been included. (see *Student Research Projects* p. 15)

Familiarization Trips

Almost sold? A visit to our facility is encouraged prior to your arrival. If you are interested in bringing groups in the future please contact the Education Coordinator. We have offered several familiarization trips in the past, which bring professors and instructors down at a reduced rate to visit our facility. These trips give you a chance to see our facility, meet our staff and familiarize yourself with the marine habitats. Contact RIMS to find out if there are any upcoming trips.

Research at RIMS



Research is a crucial tool in the conservation of marine biodiversity. The Roatán Institute for Marine Sciences (RIMS) is committed to facilitating and promoting marine investigations. In 1996, RIMS implemented a long-term reef-monitoring project conducted in areas within and adjacent to the Sandy Bay Marine Reserve. The project was designed to monitor the coral, fish, and invertebrate populations, as well as environmental parameters over time. In the past two decades, RIMS has obtained a substantial database on the status of Roatán's reefs. By continuously observing conditions over time, we can provide important information so that timely and sound actions can be taken to sustain our marine resources.

Coral populations are being assessed at several different sites within and outside of the marine reserve. This information will give us a better understanding of changes in substrate conditions due to natural and human induced impacts. Underwater sampling techniques such as point-intercept line transects, chain-link intercept transects, permanent photo stations and video transects have been utilized to assess coral cover. This assessment allows us to monitor long-term coral growth, recruitment, mortality, abundance and diversity. Coral health is also being monitored for incidences of disease and bleaching.

Surveys of fish and invertebrate populations, and relative abundance and diversity are performed throughout the year to understand the natural seasonal fluctuations in populations and if there is any change from year to year in the species represented.

The goal of our monitoring program is to better understand the natural processes and dynamics of the reefs on Roatán so that we may continue to manage these important resources in the future. This documentation will be instrumental in our efforts to expand the marine reserve and enforce laws against practices that pose threats to the marine environments on which the Bay Islands are dependent.

Coral Nursery Program

In February of 2016, our facility hosted the first coral nursery workshop on Roatán. The workshop introduced a small team of local biologists and conservation managers to coral nursery methodology and active restoration solutions. RIMS has partnered with the Roatán Marine Park, the Bay Islands Conservation Association and the ICF to establish the first coral nursery program in the Bay Islands. One of the three nursery sites selected for this project is directly in front of our facility which provides us with direct and easy access for maintenance and oversight.



The coral nursery project's goal is to enhance local populations of the once-dominant staghorn coral (*Acropora cervicornis*) and elkhorn coral (*Acropora palmata*). Threats such as disease, hurricanes, and climate change have reduced the abundance of these species throughout the Caribbean by almost 90% over the past few decades. Branching corals are crucial to reef structure and create important habitat for fish and invertebrates. Coral nurseries are an active method of restoration that will help reestablish populations of staghorn coral and other threatened coral species



Following the workshop we deployed four coral "trees" in which 400 *A. cervicornis* and *A. palmata* fragments were attached. The corals did extremely well in the first year with a 94% survival rate. In July of 2017, we partnered with the Coral Restoration Foundation to install an additional ten trees and begin out-planting (returning the nursery-reared corals to the wild). Future plans will also involve genotyping, and the introduction of new species to our nursery.

Student groups will have opportunities to assist in various aspects of our nursery program including:

- Maintenance and cleaning of nursery structure
- Fragmenting corals
- Monitoring coral stock
- Harvest, transport and out-planting the nursery raised corals back to reef
- Assist with data collection and input



Student Research Projects

Some examples of research that students have conducted in the past are listed below. Interesting and moderately sophisticated studies can be performed with simple equipment. Only a few hours of data collection can produce meaningful data, which is ideal given the length of time your group will be here.



Coral Abundance and Distribution This project involves the ability to identify coral species. Students survey coral species at a particular depth using the belt transect method. This sampling method allows us to characterize an area for the types of corals that dominate it. We have excellent slides of coral as well as a specimen collection to aid students in becoming proficient at coral identification.



Substrate Cover Monitoring Utilizing several different ecological sampling methods, students will analyze reef composition. Depending upon their identification skills, students will use life-form categories or species to quantify substrate. Experience is gained using chain-intercept transects, point-intercept line transects, and the use of quadrats. This is also an excellent opportunity to exercise calculations of diversity, abundance and community similarity indices to give students experience in ecological quantification techniques.



Coral Health Students will observe incidences of coral disease and bleaching at different sites. Underwater ID cards of the different diseases affecting coral are available. Findings can be compared from year to year to see if the incidence of these disease is increasing.



Fish Surveys Students can utilize several survey methods to measure the species diversity and abundance of fish populations. One survey concentrates on observing "indicator" fish species and is excellent for students with limited fish identification skills. Another fish survey requires an advanced knowledge of fish species. Utilizing roving diver, belt transects, or stationary sampling techniques, divers or snorkelers will record all fish species observed as well as their relative abundances.



Taxonomy This project enables students to identify and classify the major floral and faunal components associated with the reef. Students can be assigned a specific taxonomic group (i.e. Algae, Coral, Invertebrates, Fish) and be responsible for identifying the organisms in their respective group. By rotating students with different taxonomic groups at the same site, students will be able to build up their familiarity of the local species diversity.



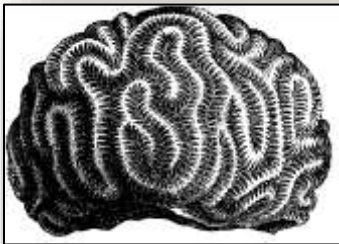
Dolphin Research Projects Under the supervision of our senior dolphin staff, students will engage in several behavioral studies that examine the patterns of association observed in the population of the dolphins that currently reside at Bailey's Key. Dolphin research projects may not be possible at certain times of the year so please check prior to your arrival.

Lecture Series

The staff at RIMS can offer lecture and slide show presentations to enhance the underwater experience. These lectures provide important introductions to the integrated tropical marine communities of Roatán and the organisms that inhabit them.



Coral Reef Ecology This lecture provides an excellent introduction of review of coral anatomy and physiology, nutrition, reproductive strategies, growth requirements, reef development and unique structural formations found on Roatán. Threats to coral and the status of the reefs in Roatán will also be addressed. Depending upon the group's background and prior instruction, this lecture may serve as an excellent refresher or as new material.



Coral Identification This presentation is a great way to identify the major coral species of Roatán and their unique identifying characteristics. A lab in which coral species can be keyed out by examining skeletal specimens may accompany this lecture. Coral Identification and Reef Ecology can be combined into one condensed lecture if desired



Reef Fish Identification Upon close survey and with keen eyes, a student can observe in excess of 60 different reef fish on any given dive. The key is being able to identify them. This presentation discusses the most commonly observed fish species. Important identifying characteristics will be addressed as well as some of the more fascinating characteristics and behaviors of these organisms and how they interact with each other and their environment.



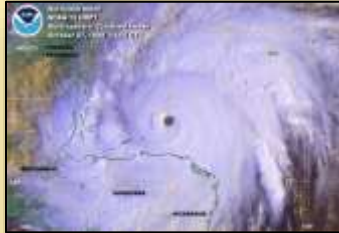
Marine Invertebrate Identification Invertebrates make up 95% of the over 2 million described species of animals. This fact is most apparent in the oceans where they make up over 88% of the multi-cellular species. Most people don't appreciate these critters as much as they should. This lecture identifies some of the more diverse and unrelated creatures that make up the marine invertebrates. Major phyla of marine invertebrates and the commonly seen species will be discussed.



Mangroves This lecture discusses mangrove distribution, species identification, adaptations and the many important functions of these extremely important coastal communities. This material is most effectively reinforced with a site visit to Man-O-War Key where there is an extensive stand of mangroves and tidal creeks in which snorkeling and direct observation can be conducted.



Coral Reef Monitoring Techniques The primary methods used to monitor coral reef biodiversity will be discussed with emphasis on the techniques RIMS uses in a long term monitoring project designed to monitor the coral, reef fish, invertebrate populations, and certain environmental parameters over time. This lecture is a good lead in to



Coral Reef Threats: Roatán's Changing Reef This lecture discusses the natural and anthropogenic stresses that coral reefs are under and how these stresses are conspiring to change the face of coral reefs around the world. RIMS has over 20 years of data on how Roatán's reefs have changed over time. The data collected from this study is presented with particular emphasis on changes in coral populations.



Sea Turtles This lecture gives a great introduction to these amazing, endangered species. Characteristics of sea turtles, species identification, nesting and emergence of the hatchlings and major threats are covered. This lecture also details a successful program in Costa Rica involving the conservation of the Olive Ridley turtle. This program illustrates how a local community and the turtle can live together and each benefit.



Dolphin Lecture Series This 2 or 3 part lecture series is described in more detail on page 19. Topics covered in these lectures include cetacean evolution, anatomy and physiology, senses, communication, cognition, intelligence, social dynamics and conservation and captivity issues.



Marine Algae This lecture reviews the major classes of marine algae, and identifies some of the more common species observed in the different marine habitats of Roatán. This lecture is great when followed by the collection and identification of different species in the field.



Coral Disease Corals, in particular, are susceptible to a number of diseases that have proved difficult to manage and have now become one of the greatest potential threats reefs face worldwide. This lecture discusses the main diseases of Caribbean corals, some of the identified causes and what can be done to manage this stress.



Coral Reef Restoration The best management tools employed in coral reefs worldwide are not achieving conservation objectives and coral reefs continue to degrade. This lecture discusses coral reef restoration, why is it important to restore coral reefs, types of restoration and the implementation of a coral nursery here on Roatan.



The Lionfish Invasion and Local Management Strategies The lionfish invasion of Atlantic waters has been ranked as one of the top emerging threats to global biodiversity. This lecture will focus on the natural history of this invasion, their large-scale impacts on native marine life and examine current local management strategies.



Bay Islands: Past Present & Future This lecture explores the cultural history of the Bay Islands and how its landscape has changed as different peoples have settled here. The second part discusses present day issues and how the impacts of development has effected the natural resources of the island. The last part of the lecture discusses the future of the islands if current impacts and trends remain in place.

Dolphin Programs at RIMS

Perhaps the most popular educational experience at RIMS is the interaction with our bottlenose dolphins (*Tursiops truncatus*). Authorization of the Honduran government permits RIMS to work with these animals for education and research. The animals are currently housed in two extremely spacious lagoon enclosures, which link the animals to the local ecosystem. Ongoing behavioral studies and medical and morphometric data has been collected since the facility opened. With this information, a database has been established whereby the health, growth patterns and characteristics unique to the bottlenose dolphins at our facility are being monitored. In addition, RIMS is currently involved in a joint project with Dr. Kathleen Dudzinski of the Dolphin Communication Project. The goal of this project is to shed light on how dolphins communicate and the meaning of their interactions. The study uses specially developed underwater video and acoustic recording equipment that localizes the sound sources of individual dolphins and facilitates examination for any relationships between dolphin sounds and behaviors. Listed below are descriptions of the dolphin related programs offered at RIMS.



Dolphin Demonstration

Dolphin presentations and training sessions are conducted weekly at the RIMS facility. These educational demonstrations teach the public about bottlenose dolphins and other marine mammals by focusing on the dolphin's unique features and abilities to exist in their aquatic environment. The demonstration lasts about 25 minutes. An article on RIMS in a Smithsonian publication states that RIMS is "utilizing the animals as an important teaching resource to introduce many aspects of the biology and ecology of cetaceans." We encourage each group to observe one of these demonstrations.

Dolphin Lecture Series

This course is an excellent opportunity for students to acquire a broad knowledge and appreciation of the bottlenose dolphin. This course utilizes slides, transparencies, and video to present an overview of dolphin anatomy, physiology, cognition, communication and social dynamics of these remarkable marine mammals. These lectures incorporate much of what we have learned about these animals at RIMS with worldwide research. Conservation and captivity issues are also addressed.

Lecture I: **Introduction to Cetaceans**
Evolutionary History
Dolphin Anatomy and Physiology
Dolphin Senses & Reproduction

Lecture II: **Dolphin Intelligence**
Cognition & Communication
Social Dynamics
Conservation of Dolphins



Dolphin Swim

The Bailey's Key facility was designed for our swim-with-dolphin program, which began in 1991. The facility is 1-½ acres and provides a spacious natural environment for its residents. After a brief orientation, students will receive a 20-minute hands-on interactive session with the animals as trainers discuss anatomical features and demonstrate certain behaviors. Immediately following this beach encounter, the students will enter the water for approximately 30 minutes of unstructured snorkeling with the dolphins. **A dolphin swim is included in the student package.**

Dolphin Dive

All of the dolphins at RIMS are at various stages of training for open-water encounters and opportunities to join our dolphins on the reef are offered daily. Each dive is completely unstructured. The dolphins join divers at a 60-foot sand flat near the reef in front of Anthony's Key. There is no feeding to entice or secure interaction with the divers. The interaction is achieved because of the dolphin's natural curiosity. Since the dolphins at RIMS are quite accustomed to the presence of divers and cameras, these dives give students the chance to observe natural interactions and behaviors from these animals that would rarely be seen in the wild. New insight into the lives of these remarkable creatures is gained as our dolphins continue to reveal the complexities of their social dynamics, their sophisticated communication abilities, and their foraging and feeding strategies. Bottom time: 40 min.

Dolphin Training Session

Under the direction of a good trainer, there is no limit to the extent of behaviors a dolphin can master. In fact, dolphins appear to thrive on the mental challenges that learning new skills provides. RIMS offers students an opportunity to work with the dolphins and the trainers and receive an intimate look at the training process. This 30 to 45 minute session allows the students to initiate various trained behaviors.



Dolphin Research at RIMS

Below is some information on a few of our research partners and the work they are conducting at RIMS.

Teresa Bolton

Teri Bolton is the Assistant Director of RIMS and has worked here for the past 24 years. She received a B.S. in Biology from Mt. St. Mary's University and has dedicated her entire career to the training and study of bottlenose dolphins. Teri runs the Dolphin Training & Research Program and her responsibilities include the daily care and well-being of our resident dolphins, the management of the training staff, and the development and evaluations of our educational programs. Teri also oversees all of our current research programs and works with scientists from all over the world to further understand this species. Her work with these animals has been featured in several educational and scientific film projects including the BBC, PBS's Nova Science Now and she was featured in the May 2015 National Geographic Magazine's article *"Thinking Like a Dolphin"*.



Dr. Stan Kuczaj

Dr. Stan Kuczaj headed the Department of Psychology's Marine Mammal Behavior and Cognition Laboratory at the University of Mississippi until his unfortunate passing this earlier this year. He and his graduate students have conducted international research on marine mammals and other animals for more than 20 years, both in the field and in facilities like ours. Dr. Stan Kuczaj's expertise on marine mammals has earned him international recognition for his study of the species' cognitive and communicative abilities. Although it is not clear that dolphins have a language, researchers like Kuczaj believe studying dolphin communication warrants more time, resources and the appropriate tools to examine their use of sounds and other signals as a mode of communication. He has been collaborating with RIMS for over a decade and his research at our facility has been featured in the May 2015 issue of National Geographic magazine, on the Public Broadcasting Service (PBS), and the British Broadcasting Company (BBC). For more information on the laboratory and Kuczaj's research, visit www.usm.edu/psy-kuczaj/.



Dr. Kathleen Dudzinski

Dr. Kathleen Dudzinski is the Founder and Director of the Dolphin Communication Project (DCP) and she has been studying dolphin behavior and communication since 1990. A primary area of research for her is on tactile, behavioral and acoustic signals employed by dolphins as they share information with each other and across groups. Some of her current investigations focus on dolphins in human care and since 2003. Dudzinski has partnered with RIMS to examine dolphin acoustics, behavior and communication. Surface and underwater observations and passive acoustic recordings of dolphin sounds and behavior are made in order to learn more about dolphin social behavior and signal exchange. Comparative studies of the behavior of captive and wild dolphins can be complimentary and provide a more complete and comprehensive understanding of both individual dolphin and group behavior. Dudzinski has spent more than 20 years observing dolphins in both settings. More information about the Dolphin Communication Project and Dr. Dudzinski's collaborative work with RIMS can be found at www.dolphincommunicationproject.org





Maya Key is the most recent addition to Anthony's Key Resort. This peaceful 11.5 acre private key is conveniently located just three minutes across the bay from the town of Coxen Hole. There are a wide range of activities for student groups to engage in. A visit to Maya Key is included in the student package and one day each week, students can plan to enjoy a BBQ lunch and spend several hours here between lectures and dives. Please keep this day in mind when planning your itinerary and schedule lectures for early morning or in the later afternoon when we return back to RIMS. While the students are on the key they can:

1. Visit Roatán's finest cultural attraction, **The Bay Island's Interpretation Center and Ethnic Honduran Art Exhibit Center**, and learn about Honduras' rich cultural heritage.
2. Explore life size replicas of the Copan Ruins
3. Take a guided tour of the Animal Sanctuary and Rescue Center and see native Honduran wildlife, such as a Jaguars, Ocelots, Margays, monkeys, parrots and reptiles.
4. Snorkel! A marked trail just off the scenic pier will lead students across the reef crest where they can explore some impressive reefs.
5. Enjoy our daily nurse shark, stingray and sea lion interactions



Planning the Itinerary

The following pages provide examples of itineraries used in the past. Hopefully they will give you an idea of how time can be budgeted. There is no shortage of activities to engage in and the course load may be increased or lightened depending on the age level and experience of each group. With the exception of a few activities, program times are flexible.

1. **Orientation:** Most arrivals are usually in the late afternoon or early evening. An orientation to the resort is provided and students are given a chance to settle into their rooms. While there are typically no other activities planned for the first evening of your stay, an after dinner lecture can be scheduled. The Education Coordinator will greet you during the resort orientation and go over any last minute questions about the itinerary.
2. **Meal times** are as follows: Breakfast is 7:00– 10:00 AM, Lunch is 12:00-2:00 PM and Dinner is 6:00-9:00 PM. Activities need to be made with these times in mind. On Wednesday evening an island fiesta is held on Anthony's Key. Live reggae music, a limbo contest, crab races, and a performance by the Garifuna dancers follow the meal.
3. **Diving.** A checkout dive is required for every person. **There are no exceptions.** Certification cards must be presented to the dive dock in order to dive.
4. **Boat use.** Almost all sites are accessible to divers and snorkelers and can be reached by boat in 5 to 40 minutes. We do not need to separate the group. Please note that while rough sea conditions may still permit diving, some sites may become less than ideal for snorkelers. Alternative activities for these members will be made in such circumstances. While we recommend breaking the 2 daily dives offered in the package into a morning and an afternoon trip, both dives can be done in the morning to allow the afternoon to be used in the lab, class or land based activities. Time does not permit both dives to be made in the afternoon. (see *Diving Options and Rates* on p. 75 for more information on dive certifications)
5. **Dolphin swim.** A swim is included in the student package but they are not mandatory. If you wish to include them in your program, we need to reserve times prior to your arrival. They run everyday at 8:30 AM, 10:30AM, and 1:30 PM.
6. **Night Dives:** One night dive off the boat per week is offered with the package. Night dives need to be scheduled for Tuesdays or Thursdays. Depending on the time of year, night dive boats leave between 5:30-6:30 PM. Night diving from shore is available every night except Sunday. Students must be out of water by 9:00 PM. Every student must have a light. Lights are for rent at the photo shop – reserve them early!
7. **Night snorkeling** around Bailey's or Anthony's Key is possible. You will be surprised by the amount of nocturnal life that you will encounter. All unsupervised water activities must be done in buddy pairs with group leaders informed. **All snorkeling and swimming activities must be done BEFORE 9:00 PM. Snorkeling around the dolphin enclosures is not permitted!!**
8. **Evening Classes:** While RIMS locks its doors at 5:00 PM to outside guests, a key can be obtained so that evening programs, labs, or study sessions can be conducted.
9. **Bus Trips:** One ½ day bus trip can be included in the package to be used as a cultural or field based science excursion. Pack lunches can be provided however they need to be requested one day in advance. Souvenir shopping trips need to be arranged separately. A good time to take advantage of the land transportation is on the afternoon prior to departure as there is no diving 24 hours before you fly. (See pp. 60-63 for a list of activities.)

SAMPLE ITINERARY #1

This itinerary is geared more towards groups coming down for one week with a limited introduction to marine biology.

Day 1 - Sat

Afternoon arrival. Check in to AKR, orientation & welcome drink. Unpack and settle in.

Day 2 - Sun

7:00	Breakfast
8:00	Orientation to RIMS
8:30	Equipment rental and CHECK OUT DIVE. Bring certification card!!!
9:30	Reef Dive – Buoyancy skills
12:00	Lunch
1:00	Coral Reef Ecology Lecture and Species ID
2:30	Dive - Identification of major coral species
6:00	Dinner

Day 3 - Mon

7:00	Breakfast
8:00	Reef Fish ID Lecture
9:00	Dive - Fish ID
12:00	Maya Key Beach picnic (Day may change)
1:00	Tour of Animal Care Facility
2:30	Dive - Fish ID
1:00	Fish Survey Methods Lecture
6:00	Dinner

Day 4 - Tues

7:00	Breakfast
8:00	Mangrove Lecture
8:30	Man-O-War Key Mangrove root snorkel Seagrass and patch reef snorkel - organism collection and ID
12:00	Lunch
1:30	Roving Diver Fish ID Survey
4:30	Dolphin Lecture I
6:00	Dinner

Day 5 - Wed

7:00	Breakfast
8:00	Invertebrate ID Lecture
9:00	Dive - Invert ID
10:30	Rocky Intertidal
12:00	Lunch
2:00	Reef Dive
4:30	Dolphin Lecture II
5:00-10:00	BBQ Fiesta on the Key Key – reggae, limbo, Garifuna dancers

Day 6 - Thur

7:00	Breakfast
8:00	Turtle Talk
9:00	Dive
1:00	Lunch
2:00	Dive

6:00	Night Dive Lecture
6:30	Night Dive
8:00	Dinner

Day 7 - Fri

7:00	Breakfast
9:00	Dive-Underwater Museum
12:00	Dolphin swim
1:30	Lunch
2:00	Coxen Hole bus trip Carambola Gardens
6:00	Dinner

Day 8 - Sat

7:00	Breakfast
TBA	Depart for Airport



SAMPLE ITINERARY #2

This itinerary is geared more towards university groups coming down for 2 weeks with an extensive background in marine biology or coral reef ecology.

Day 1- Sat.

Afternoon arrival. Check-in to AKR, orientation and welcome drink. Unpack and settle in.

Day 2 - Sun

7:00	Breakfast
8:00	Orientation to RIMS
8:30	Equipment rental and CHECK OUT DIVE Bring certification card!!!
9:30	Reef Dive - Buoyancy Skills and Underwater ID practice techniques
12:00	Lunch
1:00	Coral Specimen ID Lab
2:30	Snorkel - Coral species ID exercise
6:00	Dinner
8:00	Organism presentations

Day 3 - Mon

7:00	Breakfast
8:00	Reef Fish ID Lecture
9:00	Dive - Reef Fish ID
12:00	Maya Key picnic (Day may change)
2:00	Dive - Reef Fish ID
6:00	Dinner
8:00	Organism presentations

Day 4 - Tues

7:00	Breakfast
8:00	Invertebrate ID Lecture
9:00	Dive - Sponge ID
12:00	Lunch
2:00	Dive - Other Invertebrates
4:30	Dolphin Lecture Part I
6:00	Dinner
8:00	Organism presentations

Day 5 - Wed

7:00	Breakfast
8:00	Algae ID Lecture
9:00	Dive - Algae collection and key out
11:00	Algae Lab
12:00	Lunch
2:00	Trip to Rocky Intertidal
	Sediment sample and beach profile
4:30	Dolphin Lecture Part II
5:00-10:00	BBQ Fiesta on Key

Day 6 - Thur

7:00	Breakfast
8:00	Bus trip to Oak Ridge - Boat trip through mangroves
1:00	Pack Lunch at Paya Bay
2:00	Snorkel at Lime Key
6:00	Night Dive Orientation
6:30	Night Dive
8:00	Dinner



Day 7 - Fri

7:00 Breakfast
 9:00 Dolphin swim
 10:30 Study for midterm
 Journals due
 12:00 Lunch
 1:00 Midterm
 Afternoon free - bus trip opportunity
 6:00 Dinner

Day 8 - Sat

7:00 Breakfast
 8:00 Lecture - Marine Monitoring Techniques
 9:00 Dive - % Coral cover transect
 12:00 Lunch
 2:30 Dive - % Coral cover transect
 6:00 Dinner
 8:00 Research proposals

Day 9 - Sun

7:00 Breakfast
 8:00 Mangrove Lecture
 9:00 Mangrove Snorkel - Invertebrate zonation
 on Red Mangrove roots
 10:30 Seagrass Environment - Identification,
 sediment sampling and chemistry
 12:00 Lunch
 1:30 Back reef snorkel and organism collection
 6:00 Dinner
 8:00 Plankton Lab

Day 10 - Mon

7:00 Breakfast
 9:00 Dive - Research projects
 12:00 Maya Key picnic (Day may change)
 1:00 Tour of Animal Care Facility
 2:00 Dive - Research projects
 6:00 Dinner

Day 11 - Tues

7:00 Breakfast
 8:00 Dive - Research projects
 12:00 Lunch
 2:00 Dive - Research projects
 6:30 Night Dive
 8:00 Dinner

Day 12 - Wed

7:00 Breakfast
 8:00 Dive - Research projects
 12:00 Lunch
 2:00 Work on research presentations
 5:00-10:00 BBQ Fiesta on Key

**Day 13 - Thur**

7:00 Breakfast
 8:00 Dive - Field Final
 12:00 Lunch
 2:00 Final Written Exam
 6:00 Dinner
 Project Presentations

Day 14 - Fri

7:00-9:00 Breakfast
 9:00 Fun Dive - Wreck Dive
 12:00 Lunch
 1:00 Check out of Resort
 2:00 Coxen Hole bus trip
 6:00 Dinner

Day 15 - Sat

7:00 Breakfast
 TBA Depart for Airport

Marine Habitats & Study Areas



Marine Habitats and Study Areas

Coral Reef Profile

The narrow crescent shape of Roatán has produced very distinct coastlines on the north and south. The island possesses a narrow shelf width (1 mile/2 km) that typically drops off 150 m from shore. Flourishing on this shelf are miles of coral reef. Each dive site offers something different: steep and sudden walls, narrow canyons, overhangs, or spurs and grooves. While each site may be unique in terms of seascape, there are essentially three types of reefs: fringing reefs, barrier reefs and atolls. Characteristic fringing reefs and barrier reefs can be found on Roatán.

The island shelf is narrower on the south side and reef development is variable with no continuous barrier reef. Reefs are fringing and nonexistent at the mouths of the many bays and harbors. **Fringing reefs** are extensions of the shore and are the most common type of reef throughout the world. Fringing reefs consist of an inner **reef flat** and an outer **fore-reef**. A lagoon does not separate the seaward edge of the reef from the shore. The fringing reefs on the south are extremely different than the reefs on the north. In general, the south side of the island has more pronounced drop-offs and the walls tend to start in much shallower water (around 5 m) compared to 9 m on the north. Lettuce Coral (*Agaricia tenuifolia*) dominates the inner reef flats on the south side while more massive species of Star Corals (*Orbicella* spp.), and Brain Corals (*Colpophyllia natans*, *Diploria* spp.) are found at deeper depths. Due to the stronger currents that are often present on the south side, there is an abundance of octocorals, sponges and other filter feeders.

The reefs of the northern coast of Roatán possess the characteristics of a **barrier reef**, specifically from Gibson Bight to Santa Elena. Barrier reefs also parallel the coast but are usually found farther from shore than fringing reefs and are separated from land by a lagoon. Ten channels interrupt the reef on the north coast. Some channels are as deep as 42 m (140 ft). They are the products of coral canyon erosion during glacial epochs. Essentially there are four major habitat zones of the barrier reef. Beginning from the north shore of Roatán, there is a rather narrow **lagoon**. Sand flats, seagrass, small patch reefs, coral heads and a multitude of octocorals are found in this area. Farther seaward is the **back reef** where coral becomes a more prominent feature. The next zone is the **reef crest**. The crest forms the highest point on the reef and represents the dividing line between the inshore back reef habitats of the lagoon and the seaward reef face. This is the most structurally unstable area of the reef and the least diverse in terms of coral species.

Continuing offshore is the **fore-reef** or **reef face**. While the reef crest, back reefs and lagoons are exciting and worthy of exploration (to be discussed in detail later) it is the fore-reef that offers the greatest diversity of marine life. Coral growth and cover are much higher in the fore-reef slope. This zone is characterized by deep spur and groove formations; radiating channels of coral interspersed with sandy chutes. This type of reef formation disperses wave energy and acts as a channel in which sediment can be removed from the reef. Star corals (*Orbicella annularis*, *O. franksi*, *O. faveolata*, *Montastrea cavernosa*), brain corals (*Diploria* spp.) and Boulder Brain Coral (*Colpophyllia natans*) are abundant. Pillar Coral (*Dendrogyra cylindrus*) forms spectacular cathedral-like spires in the fore-reef slope as well. The fore-reef slope often stops abruptly at a coral wall. The near vertical escarpment drops quickly to great depths. The escarpment is dominated by shingle like growths of star corals (*Orbicella* spp.) and large delicate plates of sheet and lettuce corals, (*Agaricia agaricites*, *A. lamarcki*, *A. undata*, *A. fragilis*, and *Leptosiris cuculatta*). Flower Coral (*Eusmilia fastigiata*) is also common. There are a series of horizontal steps at various depths down the wall. There is one between 30-35 m, which tapers off onto a sandy platform that makes its way to a deeper wall that has been observed beyond that.

Inside the Marine Reserve

The following text offers a more in-depth description of reef topography within the Sandy Bay Marine Reserve (SBMR) where most of our research takes place. (See map on pg. 36)

Lagoon system

The lagoon and back reef environments display habitat distribution and coral zonation pattern typical of Caribbean islands. The lagoon harbors seagrass, algae, sand flats and patch reef communities. There are two separate systems within the boundary of the SBMR with ecologically significant differences existing between the two. These two systems, the Sandy Bay System and the West End System are described in more detail, as most of our diving will be within this area.

The **Sandy Bay System** extends beyond the eastern boundary (Lawson's Rock) of the SBMR to Gibson Bight. The estimated mean width of the lagoon is 250 meters, which makes it somewhat narrower than the West End system. Near Lawson's Rock, the inner lagoon margin is about 1 to 2 m deep and contains rich seagrass beds with small areas of rock and eroded reef, which appear to be a vital nursery areas for reef fish (juvenile grunts, butterflyfish, damselfish and others). This system has been found to be subject to higher sedimentation rates with seagrass beds and patch reefs appearing to carry notably higher sediment loads. The middle portion of the lagoon is about 4 to 5 m deep. Seagrass beds are less dense and patch reefs are larger, ranging from 5 to 10 m in diameter. The bottom slopes upward along the outer margins of the lagoon and forms the shoreward margin of the reef crest. Seagrass thins out and gives way to extensive areas composed largely of sand. As the crest is approached, the depths range from 2.5 to 0.5 m. Finger corals (*Porites* spp.), star corals (*Orbicella* spp.) and brain corals (*Diploria* and *Pseudodiploria* spp.) are dominant. Juvenile and adult parrotfish (*Scarus* spp.) are particularly numerous. There is a noticeable change in the structure of the Sandy Bay Lagoon 100 m to the west of Anthony's Key where a deep and narrow channel cuts through the reef. Increased water flow and depth in this channel allows for larger coral formations along the edges. A large expanse of sandy bottom is also present on the shoreward sides of Anthony's and Bailey's Key. To the west of Bailey's Key, the lagoon widens again forming a shallow platform about 1.8 to 3 m in depth and covered with seagrass and scattered coral heads. Lettuce Coral (*Agaricia tenuifolia*) and Blade Fire Coral (*Millepora complanata*) dominate the lagoon margin of the reef crest. The eastern margin of Gibson Bight effectively marks the end of the Sandy Bay Lagoon System

The **West End System** extends from the western margin of Half-Moon Bay to West Bay Point, which lies on the extreme northwestern tip of Roatán. The eastern most section lies adjacent to the town of West End and has been impacted by increased sedimentation, nutrient discharge and other processes that typically accompany coastal development. The coastline west of Blue Channel to West Bay is largely undeveloped. Dense seagrass beds cover most of the extensive lagoon in this area. The width of the lagoon in this section is about 350 m with depths ranging from 3 to 6 m. Continuing west, shortly before the lagoon narrows at Key Point, the reef crest becomes a discontinuous series of sections separated by stretches of sand flats. The discontinuity of the crest increases water circulation within the lagoon and permits the development of well-developed patch reefs. Seagrass thins and these large patch reefs occupy about two thirds of the lagoon. While some sections of the patch reefs are overgrown with brown algae due to increasing sediment loads, they are still rich in fish life. The crest is no longer discernable further to the west and seagrass gives way directly to the reef face. Near the end of the northwest facing shore, ½ km from West Bay Point, the seagrass beds are gradually replaced by a shallow reef platform that borders the shore. This platform marks the termination of the West Bay lagoon system.

Reef Crest

The reef crest roughly parallels the shore and forms a distinct band between 10 to 75 m in width. In most Caribbean reefs, the seaward margin of the reef crest is typically dominated by colonies of Elkhorn Coral (*Acropora palmata*) because high wave energy and water quality in this area favor the growth of this species. The reef crest in Roatán is atypical from the above description in several respects. Live stands of *A. palmata* characterize only a small fraction of the reef crest. Instead, the seaward margin of the crest is composed of a well-scoured reefal limestone or “hard pan” base ranging in depth from 0.6 to 3.6 meters. Often times this upper surface is so close to sea level that it is impossible to swim over. Small colonies of Star Corals (*Orbicella* spp.), brain corals (*Diploria* spp.) (< 1m), small patches of Blade Fire Coral (*Millepora complamata*) and Lettuce Coral (*Agaricia tenuifolia*) are prevalent. Large mats of White Encrusting Zoanthids (*Palythoa caribaeorum*) cover the base. Highly eroded bases of long-dead Elkhorn coral colonies are also observed. The lagoon margin of the crest varies somewhat according to localized conditions of bottom topography, water movement and sedimentation rates but tends to be dominated by Lettuce Coral (*Agaricia* spp.), fire corals (*Millepora* spp.) and Mustard Hill Coral (*Porites asteroides*) *Turbinaria* spp., *Dictyota* spp. and *Stypodium zonale* are also associated with the scoured limestone area.

In 1974, Hurricane Fifi struck the Bay Islands causing extensive reef damage. The present day structure and composition of the seaward region of the reef crest probably represents the early stages of a long-term recolonization process following the extensive damage from Hurricane Fifi in 1974. A sharp depth delineation to damage occurs at about 4 m. Because the similarly observed patterns of structure and composition are widespread and occur at the same depth on offshore barrier and fringing reefs, the condition appears to be the result of this severe storm that destroyed much of the *A. palmata* at the seaward crest margin. The normal patterns of recolonization and succession of a reef following a severe storm may be much slower in the Bay Islands than elsewhere due to regular scouring from the strong winter storms (“northers”) that batter the coast annually. Recolonization seems to be occurring at the same rate throughout the area. Currently, the average size of boulder corals is about 0.5 m in diameter. This size agrees with a growth period of about 15 to 20 years. Information provided by locals has confirmed that areas now largely denuded of *A. palmata* were covered with healthy extensive colonies prior to the 1974 storm. Despite past devastation, the crest still creates a massive barrier protecting the lagoon and shore.

Fore Reef or Reef Face

There are two observably distinct zones of the fore reef based on general reef structure and coral composition. The **upper reef face** begins at the seaward margin of the reef crest and extends down to a depth of 12-18 m. The upper face can be separated into the shallow fore reef and the spur and groove. Coral and fish diversity are maximal in this zone. The upper reef face extends in depth from about 3 to 18 m over the entire length of the reserve and varies in width, forming a relatively narrow band from Lawson’s Rock to the Sandy Bay Channel. Moving further west, the upper reef face narrows even more until Half Moon Bay. Beyond this point, the upper reef face widens dramatically and is extensive to Key Point, where it once again narrows. Most of the upper reef face is composed of coral spurs radiating seaward and separated by sand channels. Continuous expanses of coral spurs, generally oriented perpendicular to shore, give way to these grooves as the water deepens beyond 7 to 14 m. Within one section of the reserve, between West End and West Bay, the upper reef face is split into shallow and intermediate regions by a prominent sand channel of varying widths that parallels the crest. Below this depth range, the upper reef face gives way to the **lower reef face** or deep fore-reef. The lower reef face is readily distinguished along most of the SBMR as the upper fore reef terminates in a near vertical plunge extending to depths of 30 m or more. “Wall” diversity on this lower reef face is reduced. Plate-like growth forms become common with several species of sheet corals (*Agaricia* spp.), cactus corals (*Mycetophyllia* spp.) and star corals (*Orbicella* spp.)

forming the main components of the lower reef face. Smooth Flower Coral (*Eusmilia fastigiata*) is also common. The diverse assemblage of sponges, octocorals and black corals that adorn the wall form a community quite distinct of the upper face. The wall terminates in a sand plain. Reef talus accumulates on these sandy plains and creates a rubble habitat for sponges and other reef biota. This area slopes gradually to a second wall that plunges to depths of more than 90 m. There has been little exploration of this deeper wall. In a few areas, the lower fore-reef face consists of a succession of terraces that form a more gradual transition between the upper and lower faces.

Fish Assemblages

The following text provides a brief description of fish assemblages using broadly defined trophic groupings. While RIMS conducts fish surveys, the abundances in this report are derived from qualitative observations, and are not derived from actual counts. A complete list of fish species positively identified by staff at RIMS is available upon request.

The assemblages of reef fish on Roatán are typical in composition to reefs throughout the Caribbean. There are, however, some distinctive features. First, the reefs contain an unusually rich diversity and abundance of planktivores. This is probably related to several features of the geomorphology of the Bay Islands. Unusually high nutrient levels reach the waters around the Bay Islands, most likely the result of the close proximity to the mainland of Central America. The increased nutrient lodes support these planktonic fish communities. Incidentally, the invertebrate planktivores also show corresponding abundance and richness.

Second, while fish planktivores are abundant, Roatán maintains low abundances of benthivores. Particularly low in representation are the nocturnal benthivores such as the off-reef foraging grunts (Haemulidae) and certain snappers (Lutjanidae). The low abundance of nocturnal benthivores is likely a reflection of the narrow and shallow platform that supports the food resources of these fishes. The Bay Islands are not adjoined by the extensive shallow banks that characterize such areas as the Bahaman Banks or the Florida Keys. Instead, the shelf of Roatán plunges quickly into extremely deep water. In areas around Roatán where lagoon systems are larger, such as from Big Bight east to Santa Elena on the north side, an extensive shallow back reef area could support a large population of these benthivores. Yet the numbers in this area are also low and are most likely a reflection of the fishing pressures from the communities of Pollytilly Bight, Diamond Rock and Punta Gorda. The low abundances of nocturnal benthivores may also partially explain the paucity of certain predatory piscivores (particularly sharks and barracuda) in the Bay Islands. These crepuscular or nocturnal feeders may rely more heavily upon nocturnal benthivores as their primary source of food than diurnal planktivores.

The Sandy Bay Lagoon system appears to contain a higher diversity but overall lower abundance of fish than the West Bay Lagoon system. Increased diversity in the Sandy Bay system is most likely related to richer, more complex coral assemblages in the back reef and the proximity of all habitat types. Snappers and grunts in particular, show greater abundance in the lagoon system of West Bay due to increased foraging areas in the more extensive seagrass beds. Both lagoons provide extremely important nursery areas for many species of juvenile reef fish. An unusually rich assemblage of parrotfish is found in the back reef. On the reef crest, herbivores are dominant with the bulk of the biomass also composed of parrotfish (Scaridae). Damselfish (Pomacentridae) are also extremely abundant. The upper reef face is generally rich with planktivores and herbivores of the major families of parrotfish, damselfish and surgeonfish (Acanthuridae). Abundance levels reach their zenith just above the edge of the lower reef face beyond which damselfish populations drop markedly. Diurnal reef benthivores are relatively low in abundance with the exception of the butterflyfish (Chaetodontidae) and the hamlets (Serranidae). The primary piscivores include bar jacks (Carangidae), yellowtail snappers and sea basses (Serranidae) including hinds, coneys, and groupers.

Back Reef Areas

Of all the reef zones, perhaps the back reef area provides the most variable habitats. These areas are vital components of the reef ecosystem and are often overlooked by recreational divers. Now that the major reef zones have been described, a closer examination of the back reef area is warranted here.

Patch Reefs and Sand Flats of the Lagoon

Patch reefs occur in the protected lagoons behind the reef crest. They consist of single massive coral heads or aggregations of several different species. Patch reefs serve as small oases in the open, less protected waters of the lagoon and play a critical role in the reef ecosystem. Patch reefs begin when coral larvae find a conch shell or rocky projection in the seagrass or sand. The larvae attach and develop into a moderately sized coral head. A storm or predator may come along and kill this coral leaving limestone skeleton as prime substrate. New coral larvae will quickly settle on the skeleton and grow upward and outward building and expanding the reef. After a few hundred years, the coral approaches the water surface. Upward growth ceases and corals spread outward. Competition for space is intense on a patch reef. Algae, sponges, octocorals, anemones, and a multitude of other creatures are all competing for reef real estate.

Patch reefs experience more variability in their environment because they are located closer to shore and do not receive the moderating influence of offshore waters. They are most vulnerable to increased sedimentation and pollution from coastal activities. While many of the same species of coral, fish and invertebrates inhabit patch reefs, they are limited in diversity compared with their fore-reef denizens. The calmer waters and greater temperature fluctuations limit coral diversity to a few environmentally tolerant species that have acclimated to these fluctuations and do quite well. Finger Coral (*Porites porites*), Lobed Star Coral (*Orbicella annularis*) and Massive Starlet Corals (*Siderastrea siderea*) often dominate. Fire Coral (*Millepora alcicornis* and *M. complanata*) is also abundant. Colonial zoanthids (*Palythoa caribaeorum* and *Zoanthus sociatus*) frequently colonize areas of dead coral.

Several species of fish are characteristic of patch reefs. Surgeonfish (Acanthuridae), wrasses (Labridae), parrotfish (Scaridae), butterflyfish (Chaetodontidae) and grunts (Haemulidae) are almost always seen. Coral cracks and recesses make favorite hiding places for moray eels (Muraenidae), squirrelfish (Holocentridae) and Caribbean Spiny Lobsters (*Panulirus argus*). Other commonly sited invertebrates include the Giant Caribbean Anemone (*Condylactis gigantea*) and the Fireworm (*Hermodice carunculata*). The spines of Reef Urchins (*Echinometra viridis*) and Long-Spined Sea Urchins (*Diadema antillarum*) protrude from coral cracks and crevices. A hole littered with empty shells is a good sign that an octopus (*Octopus* spp.) is inside. Sea fans, (*Gorgonia flabellum* and *G. ventalina*), Corky Sea Fingers (*Briareum asbestinum*) and Black Sea Rods (*Plexaura homomalla*) are commonly observed octocorals.

Herbivorous animals use the patch reef as refuge during the day and venture out at night to feed in the sand flats and seagrass beds within a safe distance from cover. The sand flats, interspersed within the lagoon, may at first glance appear barren. Don't be fooled into thinking that these areas are devoid of life. They are full of hidden treasures if you know where to look. Hundreds of burrowing mollusks and echinoderms lay buried beneath the surface. The tests of Red Heart Urchins (*Meoma ventricosa*) and Sand Dollars (*Clypeaster subdepressus*) often litter the sandy bottom. The live ones are buried beneath. Look for the symbiotic Pea Crab (*Dissodactylus primitivus*) living underneath the Red Heart Urchin. Follow one of the many trails crossing the flats and you may join up with a Giant Hermit Crab (*Petrochirus diogenes*). Volcanic-like mounds reveal the homes of Southern Lugworms (*Arenicola cristata*). Upside-down Sea Jellies (*Cassiopea* spp.) may be seen littering the sand. Keep your eyes open for a Peacock Flounder (*Bothus lunatus*) or Southern Stingray (*Dasyatis americana*) partially buried in the sand.

Seagrass Communities

Where sediment has built up in the back reef, seagrass beds form rich underwater habitats. Seagrass beds are highly productive communities and often serve as transitional zones between mangroves and coral reefs. Seagrass beds cover extensive areas protected from wave energy and often dominate the lagoon areas. The resources and organisms of seagrass communities are integrally tied to coral reefs. They provide a direct food source to many herbivorous grazers, afford protection for small fish and invertebrates, contribute to an important detrital food chain and are an important nursery ground for organisms that later move onto the reef.



Turtle Grass (*Thalassia testudinum*) is the most common seagrass found on Roatán. It is extremely abundant in the calm lagoons of Roatán's north shore. Dense Turtle Grass beds act as filters reducing the velocity of flowing water. Sediment and fine particles settle on the bottom producing an ideal substrate for other marine plants and algae to inhabit. Other species of seagrass including Manatee Grass (*Syringodium filiforme*) and Shoal Grass (*Halodule wrightii*) are found in some areas illustrating seagrass transitional zonation. The diversity of epiphytic algae species living in association with seagrass communities is astounding. Many calcareous green algae species can be found in this habitat. *Caulerpa* spp., *Halimeda* spp., *Penicillus* spp., *Avrainvillea* spp., *Rhipocephalus phoenix*, and *Udotea* spp. make up a major component of the sediments in this area. *Amphiroa* spp. And *Goniolithon* spp. of calcareous red algae can often be found. *Champia* is a common seagrass epiphyte as are the encrusting red algae, *Titanoderma*, *Fosliella* and *Melobesia*.

Turtle Grass communities provide shelter, habitat, and substrate for many organisms. Several hundred

Seagrass Study Sites

There are countless sites around Roatán for students to explore patch reefs and seagrass communities. Calm shallow waters make them easily accessible. Because foul weather and storms rarely affect these areas we never find ourselves landlocked. Some sites can be accessed directly from RIMS.

West Bay Beach (Tabyana)- An excellent place for snorkeling with access directly from the beach.

Depths do not exceed 15 ft (5 m) inshore, and the fore-reef slope is within snorkeling distance from shore.

East RIMS – This back reef area offers calm, relatively shallow, seagrass beds and patch reefs which are only minutes away from the facility.



Man-O-War Key – The shallow patch reefs 8 ft (2.5m) adjacent to the mangroves offer one of the more undisturbed areas to snorkel. The extensive mangroves lining the shore and extensive turtle grass beds in the lagoon leave the water crystal clear. This area is outside of the reserve and

Bailey's Key - The shallow water ranges in depth from 2-15 ft (> 5 m) and offers excellent snorkeling. This site is great for night snorkeling. A short taxi boat ride from AKR. Follow the trail to the western side where there is an easy entry point.

Anthony's Key - The north shore has a small beach with direct access to the reef. Students can snorkel the entire circumference of Anthony's Key. On high tide there are several openings through the reef crest that lead to the fore-reef. Depths range from 1-10 ft (>3 m).

FAUNA Specifically Associated with Seagrass Beds

Turtle Grass Foram (*Archaias floridana*)
 Red Sponge (*Haliclona rubens*)
 Green Finger Sponge (*Haliclona viridis*)
 Blue Green Finger Sponge (*Amphimedon viridis*)
 Branching Candle Sponge (*Verongia longissima*)
 Chicken Liver Sponge (*Chondrilla nucula*)
 White Sponge (*Geodia gibberosa*)
 Fire Sponge (*Tedania ignis*)
 Stinging Hydroid (*Macrorynchia philippina*)
 Golfball Coral (*Favia fragum*)
 Finger Coral (*Porites* sp.)
 Shallow Water Starlet Coral (*Siderastrea radians*)
 Rose Coral (*Manicina areolata*)
 Turtle Grass Anemone (*Viatrix globulifera*)
 Queen Conch (*Strombus gigas*)
 Horse Conch (*Pleuroploca gigantea*)
 West Indian Star Snail (*Lithopoma tectum*)
 Lettuce Sea Slug (*Tridachia crispata*)
 Amber Pen Shell (*Pinna carnea*)
 Southern Lugworm (*Arenicola cristata*)
 Ghost Shrimp (*Ocypode quadrata*)

Cushion Sea Star (*Oreaster reticulatus*)
 Seagrass Brittle Star (*Ophiactis quinquerodia*)
 Donkey Dung Sea Cucumber (*Holothuria mexicana*)
 Long Spined Urchin (*Diadema antillarum*)
 Sea Egg (*Tripneustes ventricosus*)
 Variegated Urchin (*Lytechinus variegatus*)
 Red Heart Urchin (*Meoma ventricosa*)
 Flat Tunicate (*Botrylloides nigrum*)
 Encrusting Tunicate (*Botryllus planus*)
 Southern Stingray (*Dasyatis americana*)
 Needlefish (Belonidae)
 Yellowfin Mojarra (*Gerres cinereus*)
 Grunts (*Haemulon* spp.)
 Goatfish (*Mulloidichthys martinicus*)
 (*Pseudupeneus maculatus*)
 Goldspotted Eel (*Myrichthys ocellatus*)
 Some Sparid Parrotfish
 Pipefish (Syngnathidae)
 Filefish (*Monocanthus* spp.)
 Seahorses (*Hippocampus* spp.)
 Peacock Flounder (*Bothus lunatus*)



Mangroves: A Day at Man-O-War Key

Mangroves cover some 550 hectares on Roatán. This is approximately 5.2% of the total area of the island. The most extensive cover of mangroves is found between Roatán and the small island of Santa Elena to the east. This area is now a protected zone. Other mangrove areas are found lining the bights, bays and coastline of Roatán, primarily along the north coast.

The term “mangrove” is misleading. It is not a formal taxonomic term but rather an ecological term used to describe over 69 species from 20 families of tropical trees, shrubs, palms and ferns growing in the marine intertidal zone. Mangroves are halophytes, which in Latin means, “*salt plant*”. While this implies that mangroves require salt they are in fact, merely salt-tolerant. The key word is “adaptation”. Mangroves are adapted to loose, wet soils and periodic tidal submergence. Mangrove communities develop near the sea because they do not compete successfully with terrestrial plants.

Mangrove habitats are extremely important to marine ecosystems. Mangrove forests are second only in primary production to tropical rainforests with an estimated leaf drop of more than 3 tons/acre/yr. This leaf drop in turn becomes the foundation for a very complex marine food chain and detrital food cycle. The dense tangle of roots provides a vital nursery ground for a wide range of reef invertebrates and fish creating constant repopulation of animals removed from the surrounding reefs by natural causes or commercial fishing. Juvenile spiny lobsters (*Panularis argus*) may stay associated with the protective prop root community for as many as two years before they venture to the reef. The roots themselves provide a stable sheltered substrate for small delicate invertebrates.

Mangroves also protect the coast from erosion. The intricate network of roots slows down runoff. This allows sediment to sink before reaching the lagoon and reef where it may threaten the survival of the coral. Slowing the runoff also permits the mangroves to absorb many of the pollutants the runoff may contain, thus improving water quality. Most important however, is the knowledge that the mangroves, lagoons, reefs, sand flats and sea grass beds are all part of an interrelated network of life. Disturbing one habitat can have deleterious effects on the others.

Man-O-War Key is located about 30 minutes east of RIMS. This is an ideal location to get up close and personal with a mangrove community. The key itself was formed primarily through the land reclamation activities of these amazing plants. Tidal creeks and tributaries that weave through the dense network of mangrove roots create a perfect area to snorkel.

The predominant species found on Roatán are the **Red Mangrove** (*Rhizophora mangle*), the **Black Mangrove** (*Avicennia germinans*), the **White Mangrove** (*Laguncularia racemosa*), and the **Buttonwood** (*Conocarpus erectus*). There is a definite vertical zonation to these species. Red Mangroves are the most seaward of mangroves. Their highly developed aerial root systems allow them to survive in constant tidal inundation. The roots support the tree and act as a sieve to filter out fine sediments and

There are two approaches to exploring the mangroves around Man-O-War Key. One approach is by snorkeling through the shallow tidal creeks. Snorkeling allows the students to look at the dense communities attached to the prop roots. Communities found associated with the mangrove roots include algae, seagrass, invertebrates, fish and phytoplankton. Some species of algae associated with the prop roots include *Bostrichia* spp., *Dasycladus vermicularis*, *Caulerpa* spp. and *Acetabularia* spp. In addition *Halimeda* spp., *Udotea* spp., *Avrainvillea* spp., *Penicillus* spp., *Caulerpa* spp., *Rhipocephalus phoenix* and other Chlorophytes can be found in the extensive Turtle Grass (*Thalassia testudinum*) beds and the mud adjacent to the roots.



The second approach is to wade on shore and explore the tangles of prop roots from land. It's important to observe both the above water and below water communities that mangroves create. Walking around the key allows students to examine and identify characteristics of the Red Mangroves and the more landward Black Mangroves found in areas with less tidal submergence. Students can also identify some of the important terrestrial organisms associated with mangroves.

Man-O-War Key is outside of the marine reserve. Collection is allowed.

INVERTEBRATE FAUNA Specifically Associated with Mangroves

Fire Sponge (<i>Tedania ignis</i>)	(<i>Loimia medusa</i>)
Green Sponge (<i>Haliclona viridis</i>)	Coffee Bean Snail (<i>Melampus coffeeus</i>)
White Sponge (<i>Geodia gibberosa</i>)	Mangrove Periwinkle (<i>Littorina angulifera</i>)
Pale Anemones (<i>Aiptasia pallida</i>)	Lettuce Sea Slug (<i>Tridachia crispatus</i>)
Corkscrew Anemone (<i>Bartholomea annulata</i>)	Mangrove Oyster (<i>Isognomon alatus</i>)
Stinging Mangrove Anemone (<i>Bunodeopsis antilliensis</i>)	Mangrove Star Barnacle (<i>Chthamulus fragilis</i>)
Collared Sand Anemone (<i>Actinostella flosculifera</i>)	Ghost Shrimp (<i>Ocypode quadrata</i>)
Upside-down Sea Jelly (<i>Cassiopea xamachana</i> , <i>C. frondosa</i>)	Blue Crab (<i>Callinectes sapidus</i>)
Sea Wasp (<i>Carybdea alata</i>)	Land Crab (<i>Cardisoma guanhumi</i>)
Fireworm (<i>Hermodice carunculata</i>)	Mangrove Crab (<i>Aratus pisonii</i>)
Magnificent Banded Fanworm (<i>Sabellestarte magnifica</i>)	Spotted Mangrove Crab (<i>Goniopsis cruentata</i>)
Banded Featherduster (<i>Sabella melanostigmata</i>)	Spiny Lobster (<i>Panularis argus</i>)
Medusa Worm	Black Encrusting Tunicate (<i>Botrylloides nigrum</i>)
	Mangrove Tunicate (<i>Ecteinascidia turbinata</i>)
	Variable Encrusting Tunicate (<i>Botryllus planus</i>)



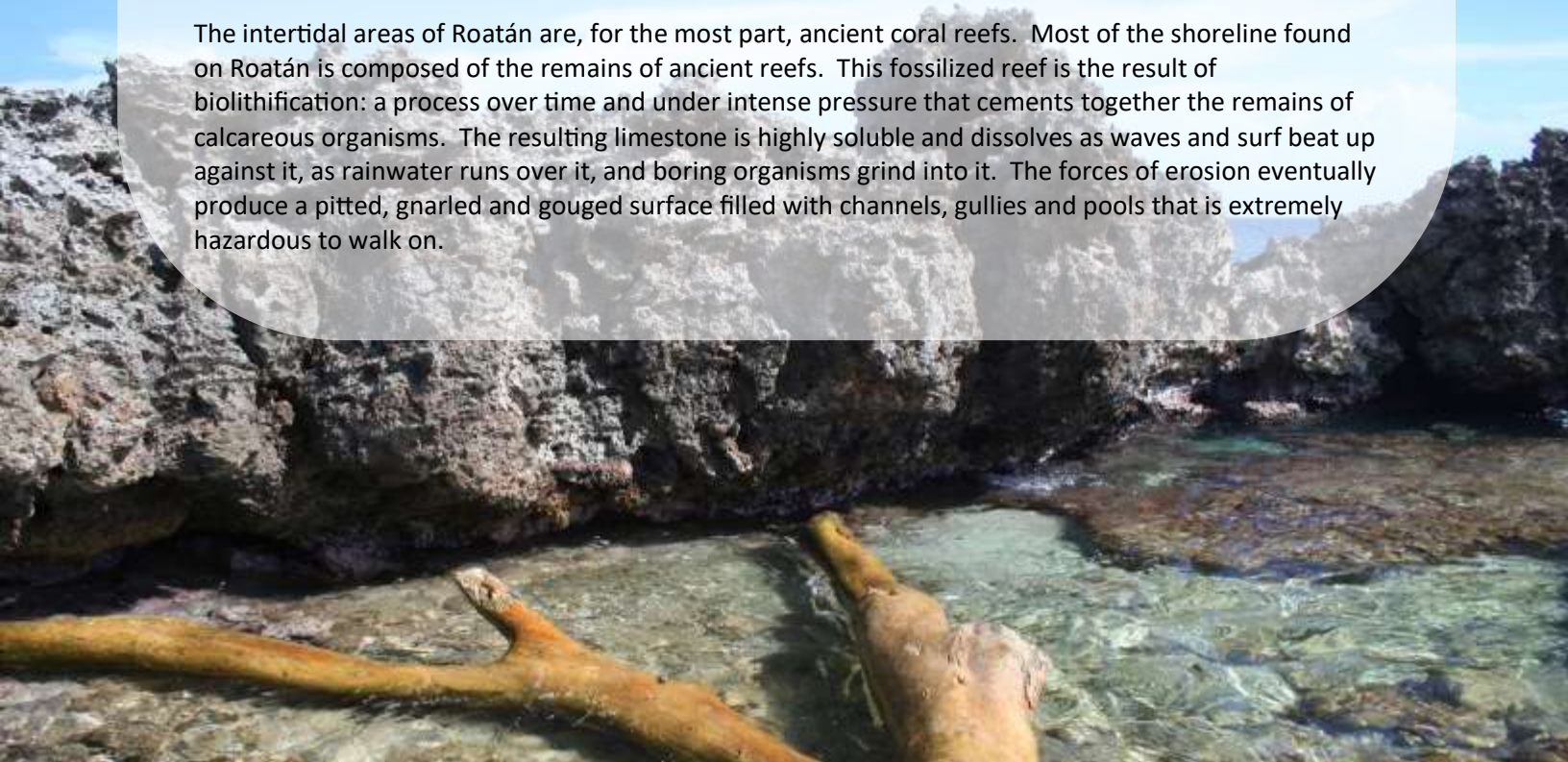
Intertidal Areas of Roatán some text by Dr. Roy Houston

The intertidal habitat is the narrow fringe between the land and the sea where many of the animals and plants are periodically bathed in seawater at high tide and exposed to air at low tide. This unique interface between land and sea contains communities of species, which are adapted to the rigors of both terrestrial and marine ecosystems. Parameters or factors, which affect the biology and distribution of intertidal species, can be of two major types. Physical (abiotic) factors such as temperature, salinity, exposure, and tidal height limit the upward distribution of species near the shore. Ecological (biotic) factors (e.g. competition, predation, and symbiosis) affect the lower limits of distribution. Intertidal communities also vary according to the substrate on which the species live. On Roatán there are rocky shores, mangrove roots, and mudflats, which contain intertidal species. Moreover, the coral reef crests and shallow seagrass beds are subject to extreme low tides and for a brief time these normally subtidal communities are exposed.

For students accustomed to the rocky intertidal regions of California or New England, the tropical rocky intertidal may appear relatively barren with little observable zonation. The differences between temperate and tropical coasts are determined by several physical factors. The tides in Roatán are diurnal. This means for approximately every 24-hour period there is one high and one low tide. When low tide occurs during midday, organisms may be exposed to the intense tropical sun for longer than they can tolerate. The tidal amplitude in the tropics is quite low compared with temperate regions. The amount of emerged shoreline at low tide can vary considerably however, depending on the beach slope. The tidal range on vertical rock faces on the north shore of Anthony's and Bailey's Key is less than 3 ft (1 m). On the gentle sloping beaches over 20 ft (6 m) of mudflats or sea grass beds may be uncovered at low tide.

Wave action is another factor that affects intertidal zonation on Roatán. Wave action is heaviest on the windward or south side of the island but even there the reefs help dissipate wave energy. On vertical surfaces, wave spray range is often greater than tidal amplitude. When wave spray is absent some zonation may occur.

The intertidal areas of Roatán are, for the most part, ancient coral reefs. Most of the shoreline found on Roatán is composed of the remains of ancient reefs. This fossilized reef is the result of biolithification: a process over time and under intense pressure that cements together the remains of calcareous organisms. The resulting limestone is highly soluble and dissolves as waves and surf beat up against it, as rainwater runs over it, and boring organisms grind into it. The forces of erosion eventually produce a pitted, gnarled and gouged surface filled with channels, gullies and pools that is extremely hazardous to walk on.



FAUNA Specifically Associated with the Intertidal

Red Forams (*Homotrema rubrum*)
 Chicken Liver Sponge (*Chondrilla nucula*)
 Finger Coral (*Porites furcata*)
 Mustard Hill Coral (*Porites asteroides*)
 Brain Coral (*Pseudodiploria* spp.)
 Shallow Water Starlet Coral (*Siderastrea radians*)
 Crenulated Fire Coral (*Millipora alcicornis*)
 Sun Anemone (*Stoichactis helianthus*)
 Deltoid Rock Snail (*Thais deltoidea*)
 West Indian Top Snail (*Cittarium pica*)
 Stocky Cerith (*Cerithium litteratum*)
 Cancellate Fleshy Limpet (*Lucapina suffusa*)
 Knobby Keyhole Limpet (*Fissurella nodosa*)
 Zebra Periwinkle (*Littorina ziczac*)
 Knobby Periwinkle (*Tectarius muricatus*)
 Prickly Periwinkle (*Nodilittorina tuberculata*)
 Black Horn Snail (*Batillaria minima*)
 Bleeding Tooth Nerite (*Nerita peloronta*)
 Four-tooth Nerite (*N. versicolor*)
 Checkered Nerite (*N. tessellata*)
 Fuzzy Chiton (*Acanthopleura granulata*)
 West Indian Chiton (*Chiton tuberculatus*)
 Scorched Mussel (*Hormomya exusta*)
 Spotted Sea Hare (*Aplysia dactylomela*)

Lettuce Sea Slug (*Tridachia crispata*)
 Ribbed Barnacle (*Tetraclita squamosa stalactifera*)
 Fragile Star Barnacle (*Chthamalus fragilis*)
 Common Shore Crab (*Pachygrapsus transversus*)
 Sally Lightfoot (*Grapsus grapsus*)
 Spray Crab (*Plagusia depressa*)
 Ghost Crab (*Ocypode quadrata*)
 Fiddler Crab (*Uca* sp.)
 Three Colored Hermit Crab (*Clibanarius tricolor*)
 Spotted Decorator Crab (*Microphrys bicornatus*)
 Giant Land Crab (*Cardisoma guanhumi*)
 Land Hermit (*Coenobita clypeatus*)
 Comet Sea Star (*Linckia guildingii*)
 Spiny Brittle Star (*Ophiocoma paucigranulata*)
 Chocolate Brittle Star (*Ophioderma cinereum*)
 Blunt-Spined Brittle Star (*Ophiocoma echinata*)
 Banded Brittle Star (*Ophioderma appressum*)
 Reef Urchin (*Echinometra viridis*)
 Rock Boring Urchin (*Echinometra lucunter*)
 Slate Pencil Urchin (*Eucidaris tribuloides*)
 Beaded Sea Cucumber (*Euapta lappa*)
 Sergeant Majors (*Abudefduf saxatilis*)
 Schoolmasters (*Lutjanus apodus*)

There are several rocky intertidal areas to explore around Roatán. Some are minutes from RIMS.

Bailey's Key. A short boat taxi ride from RIMS. Several paths provide easy access around the island.

Anthony's Key. Another short boat taxi ride across the channel from RIMS.

Flower's Bay Intertidal. Requires a 15-minute bus ride to the south side of the island. A trail provides a 15 minute walk along the shore to a large shallow bay of coral rubble and seagrass. There is an abundance of flora and fauna to study along the trail. Examples of red, black and white mangroves can be observed along the shore.

West Bay Intertidal. Located on the western tip of the island. Rocky shoreline, ironshore, coral rubble and tidal pools illustrate the zonation of intertidal organisms.

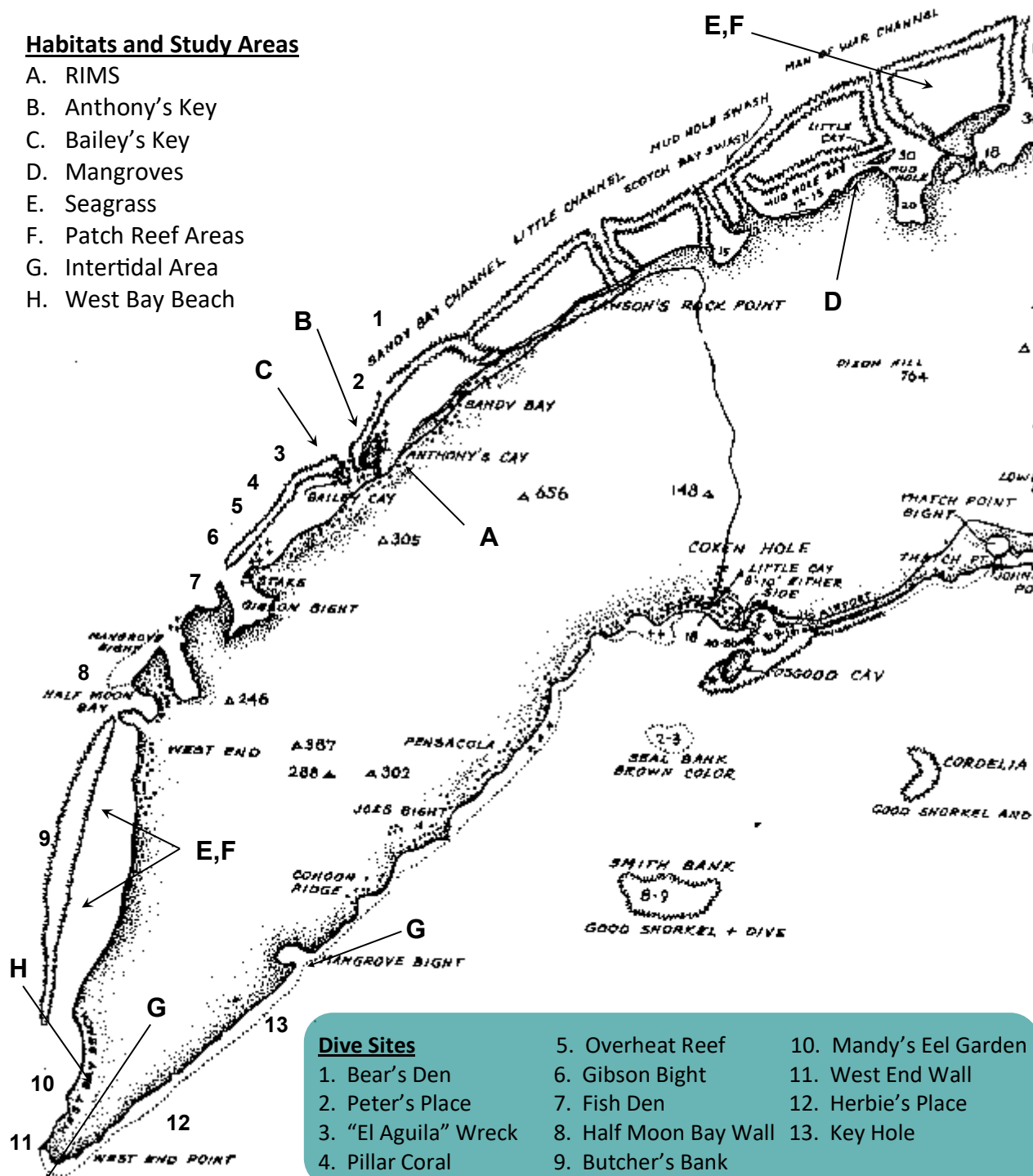


Map of the Marine Habitats

The following map of the western tip of Roatán highlights some of the marine habitats, study areas and dive sites that have been referenced throughout this guide.

Habitats and Study Areas

- A. RIMS
- B. Anthony's Key
- C. Bailey's Key
- D. Mangroves
- E. Seagrass
- F. Patch Reef Areas
- G. Intertidal Area
- H. West Bay Beach



Dive Sites

- | | | |
|----------------------|-----------------------|------------------------|
| 1. Bear's Den | 5. Overheat Reef | 10. Mandy's Eel Garden |
| 2. Peter's Place | 6. Gibson Bight | 11. West End Wall |
| 3. "El Aguila" Wreck | 7. Fish Den | 12. Herbie's Place |
| 4. Pillar Coral | 8. Half Moon Bay Wall | 13. Key Hole |
| | 9. Butcher's Bank | |

ROATÁN MARINE PARK



RIMS Education and Research Groups

The Roatán Marine Park (RMP) is a grass roots, community-based, non-profit organization located on the island of Roatán, 50 kilometers off the mainland coast of Honduras. The organization was formed in January 2005 when a group of concerned dive operators and local businesses united in an effort to protect Roatán's fragile coral reefs. Initially, the goal was to run a patrol program within the Sandy Bay-West End Marine Reserve, to prevent resource exploitation through unsustainable fishing practices. Over time, the RMP expanded the scope of their environmental efforts through the addition of other programs encompassing the entire island.

At present, the RMP, together with the Bay Islands Conservation Association (BICA), co-manages the Reserve, which is a nationally recognized marine protected area located along the northwest coast of Roatán. The RMP runs a broad range of activities to protect Roatán's natural resources, including patrols and infrastructure, education, conservation and public awareness. With a rapidly developing island, the number of challenges we face increases every day. We are focusing on engaging diverse community stakeholders to aid in developing solutions that can ensure long-term, sustainable management of our natural resources.

The Roatán Institute for Marine Sciences supports the objectives of the Roatán Marine Park. Students and interns must abide by the RMP guidelines when working on the reef. **RIMS RESERVES THE RIGHT TO STOP PRACTICES DEEMED DESTRUCTIVE AND/OR INAPPROPRIATE.**

Guidelines for Divers and Snorkelers in the Marine Park

- No gloves are to be worn within the reserve.
- No touching, or standing on corals.
- Equipment placed on the reef for research studies, such as stakes, quadrats, transect lines or flags, will be done so in a manner that is least destructive to the reef and must be removed after the study is complete.
- No permanent collection of coral, shells or other marine life without a permit.
- Harassment of any marine organisms is prohibited.
- No spear fishing or use of traps or nets to capture marine organisms.

**The Roatán Marine Park
User's Fee is US \$10.00. You
will receive a dive tag or wrist
band with this purchase.**



An underwater photograph showing a diver in a black wetsuit and blue fins swimming towards the right. The diver is positioned behind a large, intricate, branching coral structure. To the left, there is a rocky reef covered in green and white coral. The water is clear blue, and sunlight is visible at the top of the frame.

Diving & Snorkeling Highlights

Dive Site Guide

The next few pages provide information on the distinct topography and unique features of some of the frequented dive sites within and outside of the SBMR. Please keep in mind that there are over 30 moored dive sites within the reserve, so we are in no way limited to the sites described below.

There are three main points about each of these dive sites.

1. There are few places in the Caribbean that offer the diversity of fish, invertebrates and coral that can be found on the reefs of Roatán.
2. They possess distinct topography. Cracks, canyons, overhangs, swim-throughs, ledges, tunnels, walls, pinnacles, and sand chutes make for great exploration.
3. Most dive sites require a boat trip to reach them. Travel time from RIMS ranges from 5 to 40 minutes. Due to the excellent visibility and calm seas virtually year round, most sites can also be snorkeled.

1. Bear's Den

Travel Time: 10 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Intermediate (depending on dive plan)

While coral growth and marine life are abundant at this dive site, Bear's Den is best known for two attractions: a tunnel and a cave. Near the mooring at 20 feet is a large stand of Elkhorn Coral (*Acropora palmata*). In front of the mooring, a sand chute begins at 35 feet and goes to 65 feet through a tunnel where overhead cracks allow shafts of light to dance across the walls. Divers exit the swim through midway down the wall where they are met by an unexpected blue water drop-off. Large Black Groupers and several species of snapper can be observed at this site. As one proceeds to the east a large coral pinnacle appears. To the right of this pinnacle at the top of a steep curving coral wall, at 30 feet lies the entrance to a cave. This large circular chamber is well lit from small openings overhead and is filled with crabs, lobsters, and Glassy Sweepers. While the cave is off limits unless specially certified, the reef around the cave is riddled with many equally impressive cracks, ravines and swim-throughs for students to explore.

2. Peter's Place

Travel Time: 8 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Novice

Reef topography at this site is incredibly varied and provides an ideal place for a drift dive, which allows exploration of the seascape that unfolds. Three-foot groupers and snappers greet you upon descent and may make it tempting to hang out under the boat for the entire dive. The mooring line is anchored on a platform of coral at about 50 ft, which drops off onto a deep wall that tapers off at 90 to 100 ft. A wide, sandy, sloping platform continues seaward and bottoms off at 130 ft. This site exhibits dramatic spur and groove formations. Traveling east along the wall gives us an amazing look at the spectacular canyons and fissures that make this site truly memorable. Light dances through the grooves and silhouettes the schools of Creole Wrasse, Blue Chromis, and Horse Eyed Jacks. We can weave our way through a narrow canyon that opens at 50 ft and relocate ourselves along a mini-wall that rises from 40 ft to within 8 ft of the surface.



This ledge is home to hundreds of schooling blue tangs, and countless other small fish. Sea fans (*Gorgonia ventalina*, *G. flabellum*) are found lying perpendicular to the currents to trap plankton in the water as it passes over their meshed branches. Black Durgons and Sergeant Majors seem to be everywhere in the shallow depths. On the deeper ledge, Lobed Star Coral (*Orbicella annularis*), mounds of Cavernous Star Coral (*Montastrea cavernosa*) and domes of Giant Brain Coral (*Colpophyllia natans*) can be found. Parrotfish, angelfish and damselfish are abundant and easily approached.

3. "El Aguila" Wreck Dive – AKA - Deep Eel Garden

Travel Time: 5 minutes
 Typical depth profile: 80-120 feet
 Expertise required: Advanced

Deep diving and wreck exploring are possible at this site. AKR is responsible for the creation of this dive site and the history that it is making. For many years the "SS Aguila" sat weathering off the south side of Utila where it long ago ran aground. With permission from the Honduran government, Julio Galindo Sr. had the freighter transported to Roatán where it was sunk in 100 ft off the reef behind Bailey's Key. A large sand platform begins at the base of the reef wall at 80 ft and travels several hundred meters until it reaches a second and deeper wall. It is on this sand platform that the "SS Aguila" now rests, sharing its new home with thousands of Brown Garden Eels. The ship was lowered on July 3 of 1997. Within months algae colonized it. Octocorals and small hard coral colonies have now jockeyed their way onto the substrate. Curious fish such as groupers and snappers have found nice recesses in which to rest. The ship is still very much in a transitional phase. It will be extremely exciting to observe the changes that occur as more creatures colonize and inhabit the wreck and it slowly metamorphoses into an artificial reef.

The mooring buoy is secured to the stern of the wreck. Within feet from the surface, the massive ship will begin to materialize. Exploration begins at the stern, which lies on its side in the deepest water. The doors and windows of the wheelhouse provide many openings to peer into. Circling around and down onto the collapsed remains of the cargo holding area we reach a depth of 110 ft. From here we move along the bowels of the ship until we reach the bow, which rests in 90 ft of water. A large Green Moray has found residency in a patch of coral at the base of the bow. A quick circle around the front and we will move off the wreck into shallower water to end our dive along the reef wall.

4. Pillar Coral

Travel Time: 5 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Novice

This dive site is aptly named for its abundance of Pillar Coral (*Dendrogyra cylindrus*) that rises from the fore reef slope. This slow growing coral is rare in most parts of the Caribbean, but it is a common sight in the Bay Islands. Towering over the other corals, these castles of the reef reach heights of up to 10 ft with diameters of 7 to 8 ft and are most abundant at the 30 to 40 ft level. The mooring buoy is in 20 ft of water. Traveling east from this buoy, the reef slopes gently starting from 15 ft and gradually slopes down to more than 130 ft. Mountainous and Boulder Star Corals (*Orbicella franksi* and *O. faveolata*) form impressive plate like shingles that overlap down the slope. The wall itself contains impressive ridges, overhangs and small crevices. Traveling west from the mooring, a mini-wall tapers off in about 25 ft of water and drops off again to deeper depths little farther out. Schools of Bluestriped Grunts, Schoolmasters and Mahogany Snapper hide under Elkhorn (*Acropora palmata*) branches. This site is one of our permanent monitoring sites. Our temperature loggers are deployed along the depth contour of a spur at this site. In addition, 20 permanently marked quadrats are photographed twice a year.

5. Overheat Reef

Travel Time: 10 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Novice

Overheat Reef is ideal for the first dive of the trip. The mooring buoy is anchored in 15 feet of water directly adjacent to a small sandy patch at about 20 ft. This is a perfect meeting place for the divers, especially beginners, giving the group a chance to work on buoyancy skills before exploring the reef. One hundred feet seaward of the sandy area, the wall begins and drops steeply to over 100 ft. There is usually a slight easterly current at this site which may explain the large schools of Creole Wrasse, Blue and Brown Chromis and Bermuda Chubs that congregate off a point on the wall directly off from the mooring. Several large curious Black Groupers hang out at the mooring as well. Several hundred feet to the east of the mooring several, there is a massive pinnacle of coral that ascends from the depths and tops off at about 70 ft. Large masses of Flower Coral (*Eusmilia fastigiata*) and Finger Coral (*Porites porites*) cover the pinnacle top. Plates of sheet corals (*Agaricia* spp.) and star corals (*Orbicella* spp.) cascade down the sides.

6. Gibson Bight

Travel Time: 15 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Novice

The mooring buoy is anchored in 15 ft of water at the top of the fore-reef slope, which travels seaward several hundred feet before it drops onto a spectacular wall that starts at 30 ft and drops to 120 ft. Coral cover is extensive and colorful. Massive plates of star corals (*Orbicella* spp.) and sheet corals (*Agaricia* spp) cascade down the wall. Deep red coralline algae line the underside of these plates. To the west of the mooring line and 15 minutes into the dive a massive coral pinnacle ascends from the deep a few feet from the wall creating a crevice to swim through. On the other side of the pinnacle, the wall opens up into a large channel that enters into Gibson Bight. There are often two Eagle Rays hanging out at the wide mouth of the channel.

7. Fish Den

Travel Time: 15 minutes
 Typical depth profile: 15-60 feet
 Expertise required: Novice

True to its name, this site offers plenty of fish in all directions. Grunts, tangs, snappers, parrotfish, damselfish, and wrasses are all occupying their specific niches. West of the mooring is a lengthy overhang that forms a mini-wall. Beginning in 4 ft of water this shallow wall drops to about 45 ft onto a coral platform that extends several hundred feet out to a second and steep wall that drops to 130 ft. Tunnels and narrow ravines accent the coral formations. The top of this mini wall offers a profusion of life and makes this site excellent for snorkeling. Congregations of Smallmouth, French and Bluestriped Grunts hang out just below the boat. Bluehead Wrasse can be observed spawning here in the afternoon while the animated Red lipped Blenny plays hide and seek in the shallows. Fish Den is another one of our permanent monitoring sites.



8. Half Moon Bay Wall

Travel Time: 20 minutes
 Typical depth profile: 50-90 feet
 Expertise: Intermediate

Half Moon Bay Wall is a deeper dive. Plan to do this site in the morning. As the name implies, Half Moon Bay forms half a circle extending over an area too large to cover in a single dive. While the wall actually begins at 20 ft as a gradually descending slope, it levels at about 60 ft on a plateau before dropping for a second time to depths over 110 ft. We'll start the dive on this deeper wall. Deepwater Sea Fans (*Iciligorgia schrammi*), Azure Vase Sponges (*Callyspongia plicifera*) and Giant Barrel Sponges (*Xestospongia muta*) anchor precariously to the wall face. Feathery, branched colonies of Black Coral (*Antipathes* spp.) can also be found at deeper depths. While seemingly delicate in its natural form, these corals are prized in the jewelry industry and have become rare in parts of the Caribbean due to over harvesting. A resident seahorse and several spotted drums hang out on this wall. Halfway through the dive we will move up through a sand chute onto the coral plateau at 50 to 60 ft. Two very curious Green Morays and one Spotted Moray may venture out of their hiding spots to check us out. Two Nassau Groupers may also vie for your attention and may settle down in the sand next to you. There have been quite a few hammerhead sightings at this spot.

9. Butcher's Bank

Travel Time: 25 minutes
 Typical depth profile: 40-80 feet
 Expertise required: Novice

Tired of the wall? Need a flat area to conduct research? The reef at Butcher's Bank offers more than the typical sheer drop-offs found elsewhere. Drop in anywhere on this stretch of reef between West End and West Bay and prepare yourself for a diving treat.

The upper reef face starts in about 10 feet of water and provides a perfect place for snorkelers. A prominent sandy shelf of varying width splits the upper fore reef face into shallow and intermediate regions. The shallow region or first "wall" terminates in a sandy shelf at 40 ft that is interspersed with spurs and patches of coral. This area slopes gradually to a second wall at 50 ft that plunges to depths of 90 to 100 ft where another gently sloping sandy shelf is observed. Reef talus accumulates on these shelves and creates a rubble habitat for sponges and other reef biota. Most of the mooring buoys in this area are anchored in 40 to 50 ft on the first sandy shelf giving divers a choice of exploring the deeper reef face or moving up into the shallows. The white sandy bottoms and good visibility allow students to spread out and explore. Students can settle down next to a small patch of coral and observe the abundance and diversity of macro-invertebrates. There is an incredible diversity of sponges at this sight including Stove Pipe Sponges (*Aplysina archeri*), Azure Vase Sponges (*Callyspongia plicifera*), Black Ball Sponges (*Ircinia strobilina*), Variable Boring Sponges (*Siphonodictyon coralliphagum*), Giant Barrel Sponges (*Xestospongia muta*) and Branching Tube Sponges (*Pseudoceratina crassa*), Rope Sponges (*Aplysina* spp.) and Brown Encrusting Octopus Sponges (*Ectyoplasia ferox*). Pipefish and pipehorses, stingrays, flounders and schools of goatfish are often found on the sand flats. A Hawksbill Turtle is almost guaranteed to make an entrance.



10. Mandy's Eel Garden

Travel Time: 30 minutes
 Typical depth profile: 20-60 feet
 Expertise required: Novice

Located in front of Tabyana Beach off West Bay near the western tip of Roatán, the relatively shallow reef in this area slopes gently seaward. The mooring buoy lies in about 20 ft of water on a shelf of coral where the top of the reef begins. As we travel north, the reef slopes gradually to a sand flat that extends gently seaward to another wall that drops more steeply to greater depths. The main point of interest on this dive can be found in the sand flats in 55 to 80 ft of water. It is here that colonies of Brown Garden Eels reside. Hundreds of these wary creatures extend their heads and upper bodies from their sandy burrows. They continuously sway in graceful waving motions to catch plankton that is drifting through the water column. These creatures are extremely shy. One quick move may fire a chain reaction that will send these eels deep within the safety of their burrows. The gentle slope of this wall offers abundant examples of Blushing Star Coral (*Stephanocoenia michilini*) and Red Boring Sponges (*Cliona delitrix*). Schools of Creole Wrasse tend to follow our trail. Inshore of the mooring line in 20 ft is a long sand flat and hard bottom that parallels the shore. Grooved-Blade Sea Whips (*Pterogorgia guadalupensis*) stand anchored in the sand. Goatfish, Slippery Dicks and Sand Tilefish forage through the sand in search of tasty morsels. The extremely sensitive clusters of Ghost Feather Dusters (*Anamobaea* sp.) instantly retract into their tubes when closely approached. Flounders, rays and turtles are also often spotted.

11. West End Wall

Travel Time: 30 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Intermediate

West End Wall has several different mooring buoys from which to chose. They are all superb sites. West End Wall is located just northeast of the western tip of the island. It is extremely different in topography and features than it's neighbor on the south side of the tip, Pablo's Place. The mooring buoy is in 15 feet of water where the top of the wall begins. Steep ridges and coral cliffs broken by mushroom shaped pinnacles, slit-like fissures, deep cracks and narrow tunnels typify the West End area. Spotted Eagle Rays are often seen gently gliding through the blue water off the wall. As we travel towards the western tip the top of the wall flattens out at 50 ft and forms sand flats interspersed with large coral patches. There is an abundance of Pillar Coral (*Dendrogyra cylindrus*), Flower Coral (*Eusmilia fastigiata*) and Elkhorn Coral (*Acropora palmata*) at this dive site. A cautionary note: there is usually a strong current present in this area.

12. Pablo's Place

Travel Time: 40 minutes
 Typical depth profile: 20-80 feet
 Expertise required: Intermediate

Pablo's Place lies on the southwestern tip of the island where major currents on both the south and north converge and sweep off the point. Due to these currents this dive is almost always a drift dive. It is these same currents that support the lush garden of sea fans, sea rods, sea whips, sea plumes, and sponges that can be found at this site. Divers can float effortlessly with the current as the seascape unfolds and changes before them. Deep-Water Gorgonians (*Isiligorgia schrammi*) and Giant Barrel Sponges (*Xestospongia muta*) are abundant. The presence of fish becomes increasingly more spectacular and profuse as we near the western tip. The fish also become much larger. Barracuda, Pompano, Permit, Wahoo, Cero and other pelagic fish are often seen cruising by. The continuous activity of these large fish is often so mesmerizing that the massive schools of Creole Wrasse,

flowing through the dense forest of gorgonians go unnoticed. As we drift closer to the western tip the wall and slope flattens out around 40 feet and an entirely new terrain unfolds. Large stands of Elkhorn Coral (*Acropora palmata*) stretch out over large beds of Lettuce Coral (*Agaricia tenuifolia*). Black Durgons, parrotfish, angelfish, and schools of goatfish roam through the sand flats, hard bottom, and coral patches. Rays and turtles often swim past this site. The seas on the south side of the island often tend to be rougher than on the north. Rough seas and the fact that there is often a strong current need to be considered when planning a dive on this side. This site is only recommended for students with good diving skills and high comfort levels in the water.

13. Key Hole

Travel Time:	45 minutes
Typical depth profile:	40-100 feet
Expertise required:	Intermediate

Key Hole is also on the south side of Roatán about half a mile east of Pablo's Place. The reefs on the south side of the island are characterized as fringing reefs and nowhere is this more apparent than at this dive site. We enter the water only feet away from the shore, which is gouged and pitted with treacherous and virtually impenetrable ancient reef. On calm days divers can approach the shore under water and explore the strangely shaped underwater formations, caves, and connecting tunnels that have been formed through eons of wave action and volcanic activity.

The upper reef flat at this site and many other sites on the southern side of Roatán is densely covered with aggregations of Lettuce Coral (*Agaricia tenuifolia* and *A. agaricites*). These mounds spread out forming gently rolling hills. Sea rods, sea fans, and sponges proliferate in the shallow waters. The wall begins at 20 ft. The steep drop-off is dizzying. Rich growths of exceptionally large sponges and gorgonians extending their masses from the walls create an exquisite seascape. Black corals (*Antipatharia* spp.) are often seen below 60 ft. Facing the wall, one can observe a lush cover of corals, gorgonians, sponges and algae. A 180 degrees turn offers a different perspective: a view of a seemingly infinite ocean teeming with schools of wrasses, Bar Jacks, Yellowtail Snapper and the occasional pelagic fish. There is usually a current moving in the westerly direction offering a chance to relax as the waters carry us along the wall.



Exclusive Snorkeling Sites

Bailey's Key

Bailey's Key, located in the western part of AKR's property and is the home to our resident dolphin population. Access to Bailey's Key is via water taxi. The rocky shore on Bailey's Key is typically vertical with an undercut of approximately 1.5 ft height and a depth of 2 ft. The weathered coral rock is sharp and jagged and must be traversed with care.



A trail provides access to the west side of the key where you can explore the rocky intertidal or snorkel the shallow back reef. The water around the key is shallow and it may be necessary to wade out a short distance before snorkeling. Be careful to avoid the aggregations of Rock Boring Urchins (*Echinometra lucunter*). As you snorkel west of the key you travel over an extensive bed of Turtle Grass (*Thalassia testudinum*). As you continue west large boulders of coral and patches of reef and rubble are observed.



Lettuce Coral (*Agaricia tenuifolia*), (*Porites porites*) and Mustard Hill Coral (*Porites asteroides*) are the most dominant corals in this area. Black Sea Rods (*Plexaura homomalla*), Corky Sea Fingers (*Briareum asbestinum*) and sea fans (*Gorgonia* spp.) are among the more common octocorals observed. There is a prevalence of algae at this site and *Turbinaria* spp., *Dictyota* spp., *Halimeda* spp. and *Styopodium zonale* as well as *Rhipocephalus phoenix* are some of the more common species found in this area. If you carefully lift

pieces of the rubble you may find the Spiny Brittle Star (*Ophiocoma paucigranulata*) or some of the many other brittle star species that thrive in these low light environments. Reef Urchins (*Echinometra viridis*) can be seen in the cracks and holes between coral and rubble. Variegated Urchins (*Lytechinus variegatus*), West Indian Sea Eggs (*Tripneustes ventricosus*) and Donkey Dung Sea Cucumbers (*Holothuria mexicana*) are among the many other echinoderms encountered in the sandy bottom and sea grass beds of the lagoon.

Night snorkeling: Special permission is allowed to student groups who wish to participate in a night snorkel. Night snorkeling at this site is rewarding. Spiny Lobsters (*Panulirus argus*), Common Octopus (*Octopus vulgaris*) and Tiger Tail Sea Cucumbers (*Holothuria thomasi*) emerge from their daytime hiding places to feed.

West Bay (Tabyana) Beach

West Bay Beach is located on the northwest tip of Roatán and a 30-minute boat ride is required to arrive at this site. The shoreline is a picturesque, gently arching white sand beach that runs for about 1 mile with ancient coral outcrops at both ends. Most of the lagoon is occupied by Turtle Grass beds (*Thalassia testudinum*) and a variety of green algae. Farther seaward, a hard bottom with a surprising diversity of coral and fish life can be found. This is a great place to do perform shallow water coral or fish ID exercises. The hard bottom opens up to a large sandy area which parallels most of the beach about 400 feet from shore. On the seaward side of this sandy area, coral of the fore-reef extends another 300 feet to the buttress zone where depth drops from 20 to 70 feet. Corals include Staghorn Coral (*Acropora cervicornis*), Elkhorn Coral (*Acropora palmate*), fire corals (*Millepora* spp.), star corals (*Orbicella* spp.), brain corals (*Diploria* spp.) and Finger Coral (*Porites porites*).



Smith Bank and Cordelia Shoal



The Jewel of the Caribbean!!!! There are a million reasons why Smith Bank & Cordelia Shoal are so incredible. These shallow offshore banks are located several miles off the south shore of Roatán. These banks cover more than 20 hectares in area and it is here where you will find some of the highest cover of live coral in the Caribbean. Coral cover on these banks are dominated by Staghorn Coral (*Acropora cervicornis*), a species of coral that is critically endangered throughout the region. There is also an amazing shark presence and these banks are the location of an important spawning aggregation site for groupers and snappers.

Recognizing the significance of this area, the Honduran government recently declared Cordelia Bank as a Site of Wildlife Importance. This is a first for the country and an incredibly significant step in the protection of Roatán's marine resources. The Roatán Marine Park has been patrolling this area for over 5 years now and the banks have been studied by the Roatán Institute of Marine Sciences, the Shark Legacy Project, Coral Reef Alliance (CORAL), Healthy Reefs Initiative, The Nature Conservancy, and the World Wildlife Fund. It was also featured in an article on the Mesoamerican Barrier Reef in the November 2012 issue of National Geographic Magazine.

Unfortunately this site is not always accessible for snorkeling or diving due to weather conditions. The south shore of Roatán is rougher than the north shore, due to the prevailing east winds. If the conditions are good, you don't want to miss this spot!



Shark Dive

Get up close and personal with **Caribbean Reef Sharks** (*Carcharhinus perezii*) in their natural environment. The Caribbean reef shark is a species of requiem shark, belonging to the family Carcharhinidae. It is found in the tropical waters of the western Atlantic Ocean from Florida to Brazil, and is the most commonly encountered reef shark in the Caribbean Sea.

The shark dive is located several miles offshore on the southern tip of Cordelia Shoal at a site called Cara y Cara which means “face to face” in Spanish. The dive site is aptly named because you literally come face to face with between 12-15 Caribbean Reef Sharks. The max depth is 70 ft and bottom time 30 minutes. Conditions are often rough and currents can be quite strong so this activity is only recommended for divers with good diving skills. The ride out to the site is about an hour and for this reason the boat leaves early at 7:15 so that you will still be able to get the 2 dives in that are part of your program. The cost for this dive is \$100.00 per person plus tax. A minimum of 8 students is required to go as a group. This is also an activity that students can do outside of the class time.

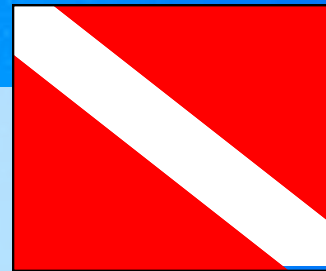


Night Diving

At dusk, a dramatic change begins to take place underwater. It becomes rush hour on the reef. The diurnal animals begin the journey to their night time hiding spots and secret dens while the nocturnal creatures that have rested all day become active. The reef takes on a new look. Parrotfish enclose themselves in mucous cocoons. Blue Tangs and butterflyfish change their markings and could be confused for new species. Reef building corals extend their tentacles to feed on zooplankton. Giant Basket Stars (*Astrophyton muricatum*) unfold from their tight daytime balls and wave their arms through the water column competing for plankton. Banded Coral Shrimp (*Stenopus hispidus*), Red Night Shrimp (*Rhynchocinetes rigens*) Spiny Lobster (*Panularis argus*) and Spider Crabs (*Mithrax spinosissimus*) all begin to forage across the reef in search of food. Tiger Tail Sea Cucumbers (*Holothuria thomasi*) extend their long bodies out from crevices in the reef to filter through the substrate. Long-Spined Urchins (*Diadema antillarum*) leave their daytime protective recesses and forage on the algae. Caribbean Reef Octopuses (*Octopus briareus*) and eels slither across the reef probing the coral crevices and cracks for unsuspecting prey. Toadfish, while rarely seen, can now be heard. Squirrelfish and grunts seen under coral overhangs in the day are out and about. Shining your light above the reef into the water column reveals dozens of tiny cardinalfish. A night dive is not complete however, until the real stars come out in the water. While there is so much to see with the aid of a dive light there is even more to witness when it is turned off. Bioluminescent creatures are waiting to take the stage. A twirl of your arms or a kick of your fin causes hundreds of microscopic organisms to bioluminesce. Brittle star arms projecting from virtually every reef crack and crevice release a trail of light that travels up and down their arms.

One night dive off the boat is included in the RIMS package. The boat leaves 15 minutes before dark so that mooring lines can be located. Each student must possess his or her own dive light. A strobe light will be hung from the boat as a reference light. While only one boat night dive is provided, night dives from shore can be done on any night except Sunday from dusk until 9:00 PM. Night snorkeling is also encouraged. There are excellent spots behind Bailey's Key and to the east of RIMS. Night snorkeling in the channel can also be rewarding because Spotted Eagle Rays often hang out here after dark. Students must inform their professors if they are going to snorkel at night and do so with at least one buddy.





Diving Rules & Regulations

Our excellent dive safety record at RIMS can be attributed to the combination of an experienced dive staff and strongly enforced policies that we require student groups to abide by. Please make the following rules and regulations mandatory reading for each student.

1. Prior to the first dive, a “**checkout dive**” in shallow water will be performed. **No one is excused.** This will require every student and supervisor to demonstrate several underwater skills. These skills include a mask flood and clear, a regulator removal and retrieval and a buoyancy test. **Individuals must be able to perform these skills before diving with RIMS.**
2. A diving certification card (PADI, NAUI, SSI, YMCA) is an absolute requirement for diving at RIMS and must be presented prior to the checkout dive.
3. No solo diving is permitted. Every diver must have a buddy.*
4. All students will be required to follow the dive profile established by the dive master. The profile for each dive will vary depending on the objectives of each activity and will take the groups needs and experience into consideration.
5. The dive master (DM) will always lead the group. No one shall swim ahead of the dive master. The DM will always be within sight.
6. Good air management is important. This is a sign of a safety-conscious diver. Dives end dives with no less than a remaining pressure in our scuba tanks between 500 to 600 PSI.
7. No dives will exceed 130 ft. This is the maximum depth for recreational diving. If this depth is exceeded, divers will be required to sit out 24 hours before diving again.
8. All dive profiles will be planned using a PADI Table or PADI Wheel for multilevel dives. Spend a few minutes practicing on the tables to brush up on dive planning skills.
9. A 3-minute “safety stop” at 15 feet will be performed at the end of each dive.
10. The deepest dive of the day will be made first. If performing a multi-level dive, the deepest part of the dive will be made first.
11. The rate of ascent should not exceed more than 60 feet/minute. If you have trouble gauging this rate, observe your bubbles. If you are ascending faster then the smallest bubbles you are ascending too fast. Generally, slower is safer, particularly near the surface.
12. At least one dive light is required for every diver going on a night dive
13. Divers using Nitrox will not exceed 1.4 ATM or 111 ft.
14. No diver will be allowed to dive if the staff at RIMS feels they are unfit.
15. No diving will be allowed 24 hours prior to flying.

***The Buddy System.** Buddy diving involves more than simply being in the same body of water with another individual. The distance between buddy divers should never exceed the distance one can swim in a normal exhalation. Variations in visibility, UW terrain, obstacles, current, and surge may dictate an even closer association between buddies. With utmost safety in mind, buddy diving also means:

1. Knowing each other’s equipment and performing a pre-dive “buddy check” prior to EACH dive
2. Knowing how to communicate underwater. Dive signals should be reviewed.
3. Being able to aid a buddy if necessary.



Dangerous Marine Organisms

There are very few “dangerous” critters on the reefs of Roatán and even fewer that need to be avoided completely. Once recognized, most of these creatures can be approached sensibly. Knowledge of these potentially harmful organisms beforehand will allow your students to relax and enjoy diving.

1. Fire Sponges (*Tedania ignis*) - This sponge is commonly found in seagrass beds and on mangrove roots. It has volcanic-like oscula and a bright orange color. This species contains toxins that are delivered through the skin by the spicules. Contact results in a chemical burn, itching, redness, and swelling. Adhesive tape can be used to remove the spicules and diluted vinegar soaks and a topical antibiotic steroid can relieve the rash.



2. Bearded Fireworms (*Hermodice carunculata*) - These marine polychaetes are predacious carnivores that feed on a variety of attached invertebrates including gorgonians and hard corals. Each body segment bears short bristle-like structures called setae. They penetrate the skin with the slightest contact and can make things unpleasant for those who touch them. Contact can cause a painful inflammation, itching, numbness and an irritating wound. Remove bristles carefully with cellophane or adhesive tape. Apply vinegar or diluted ammonia to relieve the affected area.

3. Fire Coral (*Millepora* spp.) - Fire coral is a common reef inhabitant on Roatán and it can be identified by its characteristic rusty-orange color with white tips. The skeleton is smooth in appearance and lacks the corallites of its reef-building relatives. A brush against fire coral often produces a painful burning sensation. While the pain usually subsides quickly for most, contact for some individuals can cause severe pain, swelling and welts that persist for several days. In the case of **ANY** cnidarian sting, **NEVER** rub the affected area or wash with fresh water. Both actions cause any remaining unfired nematocysts to discharge. Applying vinegar or ammonia to the sting will usually ease the pain. Meat tenderizer may also help alleviate the symptoms.



4. Portuguese Man-O-Wars (*Physalia physalis*) are highly toxic, colonial hydrozoans that possess a bluish-purple float and long trailing tentacles. Their tentacles can reach lengths of 30 feet and contact causes an intense sting. They float on the surface propelled by the winds and are sometimes observed around Roatán after storms. Animals washed up on shore should also be avoided. Detached tentacles have the ability to sting and the nematocysts are still able to fire off for some time even after the animal is dead. If stung, gently remove the tentacle fragments. Do not wash with fresh water as this will cause the nematocysts to fire. Apply vinegar to sting sites and then meat tenderizer. Do not apply if allergic to papaya.

5. Sea Wasps (*Carybdea alata*) These Cubomedusae can inflict a painful but short-lived sting. Sea wasps are approximately 1 in. in diameter, with four tentacles trailing 4-6 in. behind a rectangular box shaped body. They are most often observed in the mangroves very close to the surface near the prop roots. They also tend to inhabit shallow water on the reef at night. They are attracted to light and on very rare occasions may gather around the boat during a night dive. To avoid contact upon ascent, use your alternate air source and purge upward, just a few feet before you reach the surface. The bubbles will drive the sea wasps away clearing an area through which you may safely surface. If stung, immediately douse with vinegar or alcohol. Steroids and antihistamines may be required if an allergic reaction occurs.





6. Sea Thimble Jellies (*Linuche unguiculata*) - This cnidarian is about an inch in size, rusty-brown in color and shaped like a sewing thimble. In the early spring, (April and May) these sea jellies are sometimes blown near shore where they aggregate in large masses on the surface. In the next few weeks they reproduce and release millions of larvae into the water. While the adult sea thimble jellies are harmless, the minute larvae sting especially when they become trapped in bathing suits and wetsuits. Usually the worst symptom is intense itching that may last for several days. Some individuals may have a bad reaction to the stings and may experience a fever as well. Drying off immediately after leaving the water and taking off wet suits may help prevent being stung. If stung, neutral-

ize the enzymes by immediately washing the area with ammonia or vinegar. Cortisone and Benadryl creams often help with the itching.

7. Long-Spined Sea Urchins (*Diadema antillarum*) - These echinoderms are harmless unless touched. The spines are extremely sharp and readily penetrate the skin. A spine under a magnifying glass will show countless tiny barbs pointed toward the tip that makes removal difficult. Toxin in the spines will cause a bee-sting type of response. Soaking the injury in hot water reduces the pain in many cases. Applying vinegar (a weak acid) can help dissolve the spines. Meat tenderizer can also be used. It contains enzymes that breakdown the toxin on the spines. Normally the body absorbs the spines in a couple days. There may be a purple discoloration around the wound, which is simply pigment diffusing away from the spine.



8. Scorpionfish (Scorpaenidae) - Scorpionfish are masters of disguise and are almost impossible to detect, as they lie motionless, blending into the substrate. Their amorphous shape allows them to resemble sponges, or algal covered reef. The spines of the dorsal fin contain a venom-producing gland. Pain is usually the only symptom if punctured by the Caribbean species. The fish's toxins are heat labile so soaking the injury in hot water (120 degrees) may alleviate some of the pain.

9. Moray Eels (Muraenidae) - Despite their non-aggressive demeanor moray eels often get a bad rap. Morays constantly open and close their mouths to move water across their gills for respiration. Unfortunately this behavior reveals the eel's razor sharp set of teeth, which can be quite intimidating to a diver. Eels are reclusive during the day often hiding in dark recesses. Never stick your hand in any hole or crevice on the reef. A bite by a moray can be extremely painful and can easily get infected.



10. Stingrays - Their habit of lying partially buried under the sand makes these creatures hard to spot. Easily spooked and rarely approachable, when stepped on, these creatures react defensively and the barb at the base of the tail can inflict a nasty wound. The spine itself causes a deep cut or puncture and the venom in the spine causes severe pain. They will not attack a diver or swimmer. In fact they can't use their tail weapon effectively unless they are partially immobilized.

11. Coral Cuts - While most corals don't sting, an accidental brush up against one of these corals may result in a nasty cut or scrape that will heal slowly and be prone to infection. Wash with soap and water and apply a triple antibiotic cream after every dive.



Roatán and More

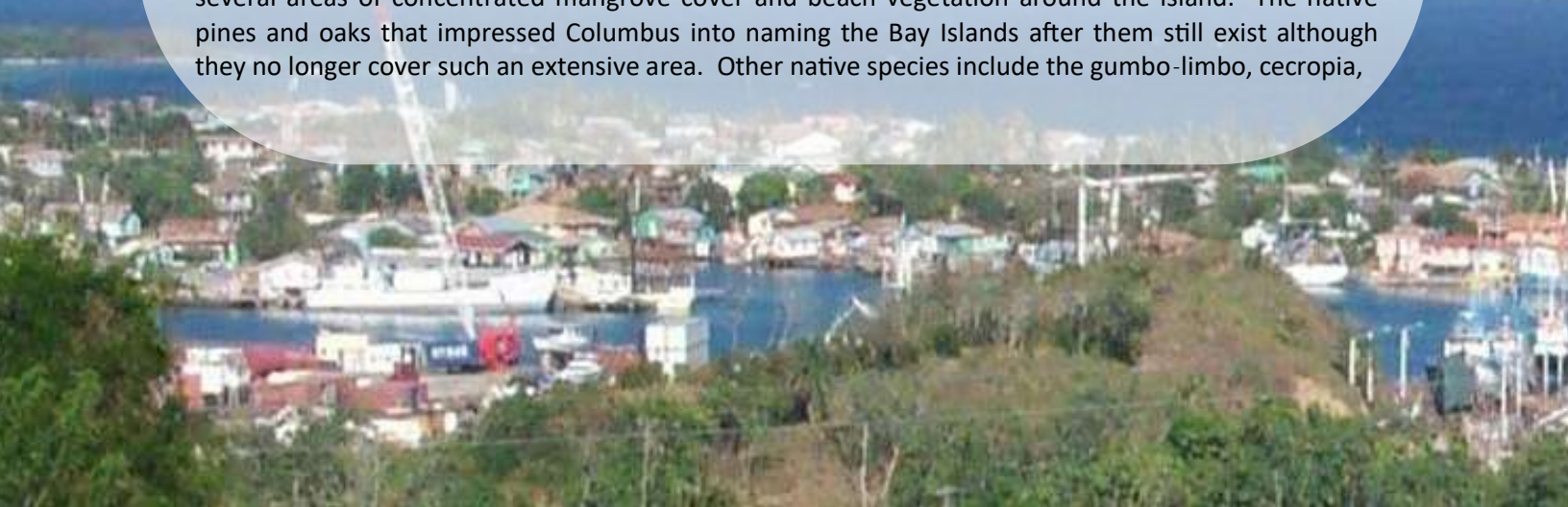
Roatán is located in the Western Caribbean (16 ° S, 86 ° W) approximately 35 miles (56 km) north of mainland Honduras. Roatán is the largest and most developed of the Bay Islands with an area of 49 sq. miles (12, 740 hectares). It has a 30-mile long E-W axis and a 1-2 mile wide N-S axis. The other main islands are Guanaja (29 sq. miles) and Utila (16 sq. miles). These islands form a 75-mile (120 km) crescent along with three smaller islands of Helene, Morat, and Barbareta and 65 tiny keys; 23 of which are found off of Roatán.

Temperatures on Roatán hover between 77 and 88 ° F. The rainy period occurs between October and January. Rainfall exceeds 6 ft or 2,000 mm annually most of which falls during the rainy season. While the length of the dry season can vary, the average length of this period is 3 months. Less than 100 mm of precipitation generally occurs from February through June with the period of dry soil occurring from March through May. The warm crystal clear waters surrounding Roatán range from 78 to 84 ° F.

The Bay Islands lie in the trade wind belt and east to southeast trade winds with 19 to 26 mph velocities are relatively constant. Periods of up to 5 days of dead calm are common in August, and each winter 5 to 7 North American cold fronts (“northers”) reach the islands bringing wind shifts to the north and west, overcast skies and prolonged rainfall. On the northern coast of the islands, winds typically blow from the east. The almost continuous influence of trade winds results in a characteristic condition of high relative humidity. While Roatán lies further west than the paths of most Atlantic hurricanes, one large one is estimated every 10 years. Before Hurricane Mitch in 1998, Hurricane Fifi in 1974 was the worst in recent times: wind speeds reached over 100 miles per hour and over 20 inches of rain fell.

Roatán has a mountainous backbone; only 2% is considered level (less < 5% grade). It's many steep peaks, some rising as high as 1,300 feet, make the island poorly suited for agriculture. While the majority of the island possesses slopes between 30 and 75%, they can attain slopes of 90% in some areas. Most level areas are swampy.

The island vegetation has been modified over the years as agriculture and exotic species have been introduced (cashews, mangos, almonds). Despite the alteration, the warm, moist climate still supports a lush diversity of plant life. Over 50% of the island is under some type of forest cover. Several vegetative types prevail. Primary, secondary, mixed, and pine forests are found on the higher ridges. Small rainforest like growths of tall hardwoods, dense palms, lianas, orchids and ferns can be found on the lower valley slopes. A thorn-scrub association is somewhat widespread in Roatán. There are also several areas of concentrated mangrove cover and beach vegetation around the island. The native pines and oaks that impressed Columbus into naming the Bay Islands after them still exist although they no longer cover such an extensive area. Other native species include the gumbo-limbo, cecropia,



strangler fig and many different palms. The trunks and branches of each tree are home to a variety of orchids, lianas, ferns and bromeliads. Drier sites are home to acacia and mimosa with their sharp

The terrestrial ecosystems on Roatán support an abundance of wildlife. While many species found here are the same animals found on the mainland, the isolation of the Bay Islands has provided an opportunity for some endemic species to evolve. There are presently nine species and two sub-species of animals endemic to the Bay Islands. Some of these species are the Roatán Parrot (*Amazona xantholora*), the Roatán Agouti (*Dasyprocta ruatanica*), the Roatán Coral Snake (*Micrurus ruatanica*), the Marmosa (*Marmosa ruatanica*) (mouse opossum), and the Rosy Boa (*Boa constrictor*). Five of the species are mollusks described by Professor Emilio Garcia of Louisiana State University in cooperation with RIMS. Wildlife that is extinct or extirpated from the Bay Islands includes the Caribbean Monk Seal (now extinct), the West Indian Manatee, and the Brown and Red-Footed Boobies.

The Bay Islands Department (political sub-division), created in 1872, is Honduras' most northern and completely insular department. In the 1992 national census it was suggested that the population of the Bay Islands was upwards of 30,000 people with the majority, about 66.2 %, living on Roatán. A recent census suggests the population has grown to 100,000. The major population centers in Roatán are Coxen Hole, French Harbor, and Oak Ridge. Smaller towns include West End, Sandy Bay, and Punta Gorda. Most people on the island are bilingual (Spanish and English) coming from a cultural heritage of English decent, African Caribbean, Indian, and Central and North Americans. You will also hear dialects of Garifuna and Creole. Roatán is the only Bay Island with an extensive road and communication system. The number of tourists that visit the Bay Islands annually now exceeds the population. This tourism is based principally on scuba diving. In 1969 about 900 tourists visited these islands for diving related recreation. That number increased to 8,000 in 1988, and doubled to 17,000 by 1992. With the expansion of the airport runway in 1990 and the completion of the first cruise ship terminal in 2000 that number has increased substantially and according to recent estimates, the number of tourists now exceed 250,000 per year.

When the Government of Honduras declared the Bay Islands a "tourist zone" on March 30, 1982, major regulatory authority for conserving the Bay Islands was transferred to the Honduran Ministry of Culture and Tourism. Growing concern over the critical balance between environmental health and economic prosperity in the Bay Islands has led to the development of several plans, which address both conservation and initiatives to increase tourism. Efforts include several studies of the Bay Island's marine ecosystems, studies on watershed management and forest protection and work currently underway at RIMS. The Bay Islands' most important conservation efforts are still in production; a governmental initiative to develop an environmental management plan to help achieve sustainable development and prevent the deterioration of the natural resources of the Bay Islands.



The Cultural History of the Bay Islands

Combine ancient civilizations, Carib Indians, African slaves, notorious swash-buckling pirates, English and Spanish conquests, sunken treasures, and a tradition of living off the sea passed down from countless generations and you have Roatán.

The cultural legacy of the Bay Islands is as rich and colorful as the marine life off-shore. At least nine cultural groups have occupied the Bay Islands. Today the islands are blessed with a distinct mixture of cultures, customs, and traditions. The cultural history of the Bay Islands dates back to the Paya Indians, a group related to the ancient and highly advanced Mayan civilization. Numerous pre-Columbian artifacts, left by the Paya, have been recovered from more than 50 sites throughout the islands. Over the years archeologists have investigated residential, ceremonial, and burial sites, and islanders are still unearthing “yaba-ding-dings”, the local name for broken clay pottery and figurines. The Roatán Museum chronicles the history of the islands in greater detail and also contains an impressive collection of these artifacts.



Columbus arrived in the Bay Islands on his fourth voyage to the New World between 1502 and 1504. He reportedly landed on Soldado Beach on the western shore of Guanaja and christened it Isla de los Pinos (Pine Island). The island was incredibly green and fertile: a virgin tropical deciduous forest with towering oak, mahogany and Ceiba trees. He also encountered the Paya Indians, living successfully off the bounty of the land and sea. Within 10 years of discovery, the Spaniards would almost completely depopulate Roatán. Over the next century, the Payans were enslaved, forced to work in the mines and sugar cane fields in Cuba, and later Christianized and used for farm labor and to provision Spanish trade ships. During this time the native population produced enough foodstuff to provision returning ships to Europe as well as settlements

Historically, the Bay Islands were situated on a major trade route. From 1536 to 1700, English, French, and Dutch pirates found the islands ideally situated for providing refuge as they plundered and looted the Spanish Galleons loaded with New World gold and silver. The English were most successful at disturbing Spanish control of the Bay Islands. The British buccaneers often hid their booty in the sheltered ports of the Bay Islands. In 1638, the English attempted to establish an agricultural colony on Roatán, challenging the Spanish dominion. In the 1640's, the Spanish tried to exile the Bay Island Indians to the mainland. There they could provision Spanish ships without also supplying food to British pirates.

Buccaneering peaked in the late 1600s. Pirate leaders Morgan, Morris, Jackson, Sharp, and Coxen all occupied the islands at various times before British military occupation in 1742. The port town name of Coxen Hole dates from this period. Some believe the treasure from Morgan's 1671 raid on Panama still lies buried on Roatán.

Both England and Spain claimed the islands from 1650 to 1741, but neither government exercised control until the occupation of the British military began. Pirates settled down and raiding and pillaging were soon replaced by cultivation of sugar cane and trading. Cannons and fortifications of the British Fort George can still be found on Fort Key, just offshore of the town of Port Royal. The British vacated the island in 1752 after signing a treaty with Spain. Their departure would not be permanent.



The first permanent settlers in the Bay Islands were the black Caribs (Garifuna). They were a mixture of the Island Carib Indians and translocated Africans from the eastern Caribbean island of St. Vincent. They were forcibly moved to Roatán in 1797. While some moved to Trujillo on the mainland, many settled in Punta Gorda. They selected this area for the abundance of Cohune trees from which they built their unique dwellings. They also brought with them seeds for the majestic Royal Palm.

The next permanent settlers were the Cayman Islanders of English and Scottish descent. These planters founded many of the settlements in Coxen Hole beginning in the 1830s and extended to other places. The famous Cooper family would settle at Osgood Key off of Coxen Hole. Emancipated slaves from the Cayman Islands came soon after. The government of Honduras left the islands largely unattended and the islanders grew accustomed to an autonomic, self-governing system greatly influenced by their legacy of English rule. Eventually though, the residents decided they needed a more structured system. Instead of turning to Honduras, the islanders turned to authorities of the British colonized Belize. Mid century, in a controversial maneuver, England formally annexed the Bay Islands as a colony.

A cultural landscape representative of the Colony Era developed. Large tracts of land were cleared for plantations of coconuts, plantains and bananas. Despite the long tradition of British involvement, the United States was strongly opposed to the expansion and helped force the British to cede the islands to Honduras. In 1861 the Wyke-Cruz Treaty between Honduras and Great Britain recognized Honduran sovereignty over the Bay Islands. The government of the mainland placed the islands under their rule. English was abolished in schools. At the time of the treaty however, the Bay Islanders were more interested in remaining a part of the British Empire. The independence of these proud islanders is reflected today in their musically meshed languages, Garifuna and English cultures, and religion (Protestant) of most inhabitants.



Around this time, in the 1860s, the fruit industry began to prosper and the New Orleans and Bay Islands Fruit Companies were formed. Commercial fruit growers in Utila and Roatán began exporting bananas, plantains, and coconuts to the U.S. In 1877, a hurricane coupled with Honduran competition from the mainland decimated the fruit industry for several decades. At the turn of the century, islanders deserted their large fruit plantations and headed out to sea and they were soon recognized as fine seamen. Shipyards were constructed and the island gained an international reputation for building seaworthy vessels. The landscape lost its tallest hardwoods to the newly flourishing ship

building industry. Until recently, seafaring has traditionally provided most of the income for the Bay Islanders. This activity began with the harvesting, processing, and export of shrimp, lobster, and conch and expanded to include several fish species. While many locals still derive some income from fishing, the principal income is now derived from tourism.

Geology & Geomorphology of Roatán

text by Dr. Carol Eckstrom

Roatán lies upon the Bonacca Ridge, an undersea extension of the Sierra de Omoa mainland mountain range. Utila, Barbareta, Guanaja, and the Swan Islands are also part of this ridge, which extends ENE. To the north, a transform fault zone called the Swan Island Fault Zone separates the ridge from a deep ocean trench, called the Cayman Trough. The movement along the Swan Island Fault Zone is left lateral (the Bonacca Ridge area is moving east relative to the Cayman Trough which is moving west.) To the south, the Bonacca Ridge is separated from the mainland of Honduras by the Tela Basin or Gulf of Honduras. The boundary between the ridge and the Tela Basin is a normal fault. All of these features, the Cayman Trough, the Bonacca Ridge, the Tela Basin and the northern part of Honduras are part of the North American/Caribbean plate boundary zone. Consequently, the geology here is complex.

Roatán is composed of predominantly metamorphic and igneous rocks, which are riddled with faults. Lallemant and Gordon (in press) are proposing that metamorphism and ductile deformation occurred during the Late Cretaceous/Early Tertiary time as a result of the collision of two plates. Later, during the Late Eocene or Early Oligocene, the area was uplifted and brittle deformation occurred.

The metamorphic and igneous rocks have been divided into two packages by McBirney and Bass (1969): a high-grade package (formed under high temperatures and pressures) and a low-grade package (formed under lower temperatures and pressures). They assumed that the low-grade package was thrust over the high-grade package on a low angle south dipping fault. The high-grade package consists mainly of gneisses and mica schists, which are found throughout the central zone of the island from West End to Punta Gorda. From Punta Gorda eastward there is a low-grade package of chlorite schist, serpentine, (meta) sandstone conglomerates, marble and limestone. These rock formations have generated soils that are shallow, easily eroded and infertile.

The island is rimmed in part by exposed Pleistocene reef that extends from Man-O-War Key on the north side around West End and continues east on the south side of the island to at least Coxen Hole. These reefs have been dated at around 135,000 years.

Flowers Bay Beach Area: Beach rock is exposed in the intertidal area. Two distinct elevations of the Pleistocene reef occur on opposite sides of the road by the bridge. South of the bridge, species of *Agaricia*, *Orbicella*, and *Diploria* have been observed. Further to the west along the shore it is difficult to distinguish what corals make up the Pleistocene reef. It is iron oxide and has been called the "Ironshore" formation in the literature. Further west at Mangrove Bight beach rock is also exposed along the bay.

West End Point: The published geologic maps show only two basic rock types in the West End area. There are four or five types of metamorphic rocks, however, fringed with the Pleistocene Reef. The rocks are part of the high-grade package and consist of muscovite schist, biotite schist inter-layered with marble, and amphibolite schist. The strike of the rocks basically follows the topography of the land. Faulting has occurred forming a horst block with the Pleistocene reef uplifted approximately 9+ meters on the north side and 3+ meters on the south side. Separate studies are currently underway to examine the timing of the uplift and to investigate the petrogenesis of the carbonates. There are excellent exposures of storm deposits cemented into the Pleistocene reef extending along shore from the large grassy field southwest to the point. The ironstone is well developed on the Pleistocene reef on the south side of the point.

Interesting Outcrops: Because tropical vegetation covers much of Roatán, most of the outcrops that have been described occur along the roads. In the Big Bight turn off area on the main highway to Oak Ridge there are numerous exposures of igneous rock to examine.

A more in-depth field guide on the geology of Roatán is available upon request

Island Excursions

There is much more to explore on Roatán than coral reefs. Take advantage of the bus trip included in your package to adventure on land. Whether to experience the culture, examine the terrestrial environments or explore the unique geological features of the island, there is something for every group. Additional bus trips can be arranged for an extra charge.

Culture in the Towns and Villages

While development and an increasing presence of foreigners has begun to alter lifestyles and living standards in the Bay Islands, life on Roatán is much like it has been for decades. Most of the island population is concentrated in a few towns and villages. Colorful wooden houses line narrow winding and often unpaved roads. There are no stop signs or traffic lights. Shops carry only limited inventories of necessary items and rely on products shipped from the mainland of Honduras. Local tailors make much of the clothing and school uniforms. A visit to one or several of these towns will give you some insight into the culture and way of life for the majority of islanders.

Coxen Hole

Coxen Hole, is the largest town and capital of the department of the Bay Islands. Named after the pirate John Coxen, this town bears the only name that survived the days of buccaneering. Coxen Hole is about 7 miles (11 km) from RIMS on the south side of the island. Right before the entrance to the town is a bilingual school that was founded by Mrs. Cheryl Galindo. Field trips to the school can be arranged. Several miles to the west of town is the community of Flower's Bay. The Flower's Bay Methodist Church is over 300 years old.



French Harbor

Six miles (10 km) to the east of Coxen Hole on the south side is the town of French Harbor, one of the most bustling community on the island. This town is home to one of the largest fleets of fishing vessels in the Western Caribbean and is an important economic hub of the island.

Oak Ridge

Thirteen miles (22 km) east of Coxen Hole on a winding road that offers breathtaking panoramic views of both the north and south side of Roatán is the port of Oak Ridge. Until recently, access this far east was limited. As a result, Oak Ridge has changed little with the passage of time. Oak Ridge is a working town, and fishing is the industry. Most of the community is built directly over the water. Transport is via small, motorized dories. For a fee, boat tours can be arranged to take students through the extensive mangrove swamps found along the shore. Bus transportation to Oak Ridge is about 40 minutes.



Punta Gorda

On the North side of the island, directly opposite of Oak Ridge, is the Garifuna community of Punta Gorda. The Garifuna or Black Carib culture originated over 300 years ago with the mixing of Island Carib Indians and Africans from the island of St. Vincent in the Lesser Antilles. In 1796, fearful of recurrent uprisings, the English forcibly removed the Africans from St. Vincent and marooned them on Roatán. Punta Gorda became the first Garifuna settlement in Central America. Today, it is the only remaining Garifuna community on the island. Life has remained virtually unchanged. To celebrate their arrival to Roatán, the community has a carnival every year on April 12. If you are here on that day it is well worth the trip to take part in the festivities.

**Port Royal**

While Punta Gorda marks the end of the paved road, a dirt road leads further west to the communities of Camp Bay and Port Royal. There is very little infrastructure in these areas. During the first military occupation of Roatán, English forces planned many towns in the Bay Islands including Port Royal, which was to contain 5,000 to 6,000 families. While there is little evidence that this plan ever materialized, several 18th century maps reveal detailed plans and layouts. Cannons and fortifications of the British Fort George can still be found on Fort Key, just offshore of the modern town of Port Royal.

West End

West End is a relatively small sleepy beach community 3 miles (5 km) to the west of RIMS and is the community most frequented by tourists. Inexpensive bars and restaurants line the beach. The atmosphere is laid back with several souvenir stands catering to foreign visitors.



Observing Nature

Carambola Gardens

Bill and Irma Brady opened Carambola Gardens in 1985. Situated along the banks of "Mahogany Creek" these gardens are home to a wide variety of tropical indigenous and exotic plants. The many trails showcase flowering plants, ferns, spices, palms, fruit trees, carambola trees, and hardwoods including the world famous Honduran mahogany.

The short, easy Garden Trail takes you past labeled trees, while the 20-minute hike up the Rainforest Trail will take you to the summit of Carambola Mountain. Upon reaching the summit, one is greeted with a magnificent panoramic view of Roatán's reefs. On a clear day, Utila, the smallest of the Bay Islands can be seen. The gardens are open from 7:00 AM to 5:00 PM daily. Guided tours can be arranged. Bill or his daughters can provide an abundance of information on the medicinal and functional uses of the different plants found along the trails. A guided tour is \$ 10 per person. [Walking distance from RIMS.](#)



Gumba Limba Park

The Gumba Limba Park is located in West Bay. This animal preserve offers shoulder friendly monkeys, free-flying exotic birds, basilisk lizards, baby water buffalo and other native animals. The botanical gardens showcase over 200 colorful plant and tree species, numerous waterfalls, fountains, and a picturesque hanging bridge over the fishing pond. "Coxen's Cave" is exciting and educational and offers a history of the island through artwork painted on the cave walls, life-size pirates, treasure, weapons and maps. The park is open daily from 9 AM to 4PM. Admission is US \$25 alone but if this excursion is combined with the Canopy Tour (see below) the total cost is US \$55.

The Canopy Tour

Enjoy a thrilling soar through the treetops and zip from tree to tree high above the lush forest floor. Ten exciting traverses will take you all the way from the top of Roatán's mountainous backbone to the middle of the beautiful sandy beach of Gumba Limba Park, West Bay. Surrounded by magnificent foliage you'll be tempted to let out some Tarzan yells when you take the "leap of faith." But with double line cables, expert guides, and mountain-climbing gear fastened about you and heavy gloves, you'll have more peace of mind than on Tarzan's swinging vines! The tour lasts about one hour. And it is open 9 to 5 daily. The price is US \$35/person and includes transportation.



The Iguana Farm

One of the little known treasures on Roatán is Sherman Arch's Iguana Farm. Sherman started his farm about 18 years ago. It has now become a family operation with his four children and wife helping with the feeding and care of the iguanas. While iguanas are a protected species on the island, hunting still exists and their habitat is being lost as development increases. Today, about 2700 iguanas roam freely about his property! The Iguana Farm is located just past the town of French Harbor. Feeding time is early afternoon which is the best time to arrive if you want to handle the iguanas. Turtles, monkeys and a tarpon pen are also found here. The farm is open daily from 8 AM to 4 PM. and the admission is \$10/person.



Daniel Johnson's Monkey and Sloth Hangout

This small animal park is located in French Cay, just past French Harbor. This island attraction offers hands on interactions with sloths, white faced capuchin monkeys, spider monkeys, the indigenous Agouti or Guatusa, (also known as the Island rabbit) and coatimundis, a raccoon like creature that is sure to please, This facility is very close to the iguana farm and can be combined into one excursion.

Blue Harbor Arboretum & Hydroponic Garden

Blue Harbor Tropical Arboretum provides a safe and stunning location to appreciate the natural wonders of Roatan. Blue Harbor covers over 160 eco-friendly acres and the location offers gorgeous tropical botanical gardens and fruit orchards for you to explore. Guided tours of our botanical gardens, conservatory and fruit orchards, nature hiking, bird watching, and even a mud run and obstacle course for more active travelers are just a few of the activities you can partake in.



A visit to Blue Harbor is not complete without a tour of the hydroponic farm, which is leading the way in water conservation and sustainable farming practices on Roatan. Hydroponics is a method of growing plants using water and mineral nutrient solutions instead of soil. It is the future for safer, fresher, longer-lasting produce. Much of the lettuce and herbs AKR uses in their salads and meals is delivered within hours of harvest 3 days a week to the resort. It can't get much fresher than that!. No pesticides are used on their produce and they are very sensitive to the use of the island's resources. This tour offers an incredibly interesting glimpse of technology fast becoming mainstream

Mainland Excursions

If your stay at RIMS will be longer than one week, trips to the mainland of Honduras are possible. Honduras boasts indescribable biodiversity, undisputable natural beauty and ancient Mayan ruins, all of which are worthy reasons to plan an excursion to the mainland. These trips are easy, affordable and can be made in a day or two. Plans can be made through Bahia Tours or through RIMS.

La Ceiba

Most overnight mainland excursions involve a stay in the coastal town of La Ceiba. While La Ceiba is the third largest city (pop. 80,000) and second major port in Honduras, it comes in first as the capital of eco-tourism and adventure travel. Tours out of La Ceiba include day excursions to the Pico Bonito National Park, the Cuero y Salado Wildlife Refuge and white water rafting on the Cangrejal River. This port city credits its commercial, social and economic growth to the long presence of the Standard Fruit Company that has exported bananas and citrus fruits since the turn of the century. The presence of this company, regular contact with U.S. ports, and the proximity to the Bay Islands has led to a major bilingual population in this town. Several inexpensive and safe hotels are available if your mainland trip involves an overnight stay.

White Water Rafting on the Rio Cangrejal

The Rio Cangrejal is a beautiful Class III and IV whitewater river that forms a natural boundary for the Pico Bonito National Park. Its crystal clear water is cool and inviting as it plunges between sculpted granite. The river flows through a spectacular virgin rainforest providing an ideal location to discuss river geology and tropical rainforest ecology. Trips are made as interpretive as possible. The guides are quite knowledgeable on the infrastructure of the country so it's also a good chance to expound on the Honduran history, politics, economics and the local campesino culture.

The Cangrejal stretches over 20 miles (32 km) as it drops 787 ft (240 meters). The first half of the trip offers technical stretches. The river weaves through towering boulders and splashes through steep drops. The second half features longer wave rapids. The rainforest is incredibly lush and green and the water averages 80° F. There's time to exit the boat and make your way 100 ft up a smaller stream until the lofty canopy closes in and the perpetual twilight of the rainforest can be experienced.

Lunch is provided along a shaded portion of the river's bank. Afterward, there will be more rafting with opportunities to drift through quiet stretches, and leap from the rocks into some of the deeper pools. The trip provides frequent sightings of egrets, herons, toucans, kingfishers, and parakeets.

This trip is an easy one-day adventure from the island of Roatán. Transportation to and from the river is provided. Although the river runs the entire year, the Cangrejal is typically at its highest levels from September to January (wet season) and lowest from March to June (dry season).

Pico Bonito National Park

Honduras recognizes the importance of preserving its natural resources and biodiversity and has placed more than 18,040 sq. miles (28,860 sq. km.) or 25% of the country under official protection. Honduras boasts 20 national parks, 10 wildlife refuges, 10 biological reserves, and one biosphere reserve which offer a variety of protected habitats to explore.



The Pico Bonito National Park, just 9 miles from La Ceiba, offers a great mainland excursion. Rising magnificently from the coastal plains of La Ceiba to a summit of 8,025 ft (2,435 m) is Pico Bonito. Only a well-planned expedition can make it to the summit. In fact, to this day, less than a dozen known expeditions have been successful. The park, established in 1987, encompasses 975 sq. miles (1,570 sq. km.) of lush cloud forests and pristine rainforests. Inhabiting the park is the country's greatest collection of plant and animal species, which enjoy protection thanks to the area's geographical characteristics, which make access difficult and almost impassable. Among the park's fauna are the resplendent quetzals, tapirs, jaguars, and several species of monkeys. During the rainy season, countless waterfalls spout from the mountainsides. Many day hikes offer incredible wildlife viewing opportunities along the trails and waterfalls along the way.

The park is managed by the FUPNAPIB (Pico Bonito National Park Foundation) who offers organized tours and local guides. Campgrounds and dorm style facilities are available within the park. Hotel rooms are also available nearby. The trip includes transportation to and from the reserve and lunch. Inquire for prices, which are subject to change.

Cuero y Salado Wildlife Refuge

The Cuero y Salado Refuge encompasses 5.3 sq. miles (14 sq. km) of tropical wet forests and mangroves situated along the canals and estuaries of the Cuero y Salado Rivers. This refuge is located some 20 miles outside of La Ceiba. The 40-minute drive to the refuge ends at the little town of La Union. From here you will catch the coconut train. The train, which belongs to the Standard Fruit Company, is definitely part of the adventure providing an incredible opportunity to view the many species of birds typical of this region. The train tracks end at a small coconut plantation, and the refuge's visitor's center. After a short tour of the visitor's center you will board small boats to explore the complex waterways within the reserve. Transportation within the reserve consists of motorized skiffs or canoes. Local guides will take you to the most ideal spots for viewing wildlife. An English-speaking guide will be there to help interpret.

The boats journey through mangrove-lined canals where white-faced capuchins, howler monkeys, caimans, alligators and countless birds abound in over 200 species of trees. This refuge is also home to the sacred and endangered West Indian manatee. Weighing in excess of 1,000 pounds, these reclusive herbivores hang out in narrow waterways just below the surface munching on a diet of sea grass. These creatures are highly sensitive to the slightest changes in their habitat. Degradation of pristine habitat by upstream deforestation and agricultural uses is the primary threat to these gentle creatures. After a morning of wildlife observation, lunch will be served on a beautiful wild beach. The train typically departs around 2:00 PM and transportation to the airport is provided.

The most optimal time to view the most wildlife is very early in the morning. An early start of 6:00 AM is recommended in order to maximize the wildlife viewing opportunities. Late afternoon flights out of Roatán and inexpensive hotels can be arranged in order to be in La Ceiba at this early hour.

Copan

Many centuries ago in a region encompassing what is now Southern Mexico, Guatemala, Belize, El Salvador and Honduras the Mayan civilization was born. These ancient architects raised temple upon temple to honor their kings in a forested land of incredible beauty. Quetzals, jaguars, monkeys and macaws shared this natural and spiritual world with the Maya. Honduras proudly possesses one of the most intricately sculpted and most preserved sites of the Mayan world: Copan.

Left in ruin and reclaimed by the forest, Copan still appeared as a great masterpiece of antiquity to explorer John Lloyd Stephens upon discovery in 1839. It was reported that he purchased the site from a local landowner for a mere \$50. The history of Copan spanned nearly four centuries from 465 AD to 800 AD. The ruins of Copan are thought to have once sheltered a population of up to 30,000 people during the late classical period of Mayan development (AD 600 to AD 800). This architectural site occupies an area of nine square miles and encompasses in all, nearly 4,000 structures. Imposing monuments in stone are still being excavated and Copan is now believed to contain the largest number of sculptures and stone works including temples, plazas, ball courts, altars, and stelae. In 1980, UNESCO declared this area a World Heritage Site. Standing proudly, seemingly invulnerable to the passage of time, what distinguishes this city from lesser Mayan settlements is the richness of its sculptural work. Scholars recognize the ruins of Copan as the highest artistic and cultural achievement of the Mayan civilization. One of the most impressive works ever uncovered is the Hieroglyphic Staircase. It contains the longest written text in the New World and includes 1,250 inscribed blocks that provide information corresponding to 200 years of Mayan history.

Getting there:

Travel to Copan entails a 40-minute flight to San Pedro Sula and overland bus transportation to the town of Copan where hotel accommodations will be provided. Arrangements can be made through the resort or Bahia Tours.



Travel Preparations

PRIOR TO DEPARTURE:

1. At least 6 months prior to your desired dates of travel contact **BAHIA TOURS** to reserve your space. January, March, May, June, July and August are often our busiest months. Try to reserve one year ahead for these times. A \$100 deposit per person is required to guarantee the reservation.
2. **BAHIA TOURS** can help with travel arrangements. Certain times of the year are more traveled than others. Book early to ensure available seating and less expensive fare.
3. The Education Coordinator will work directly with your group during your stay at RIMS and can help you with the planning of your itinerary. It is a good idea to contact this person several months prior to your visit to work out the details of your trip.
4. Begin your recruitment program as soon as possible.
5. Maximum group size is 24. A complimentary land trip is offered to group leaders for every 11 paying students.
6. In order to guarantee your space and room assignments, payment must be received in full at least 45 days prior to departure. Cancellations received 45 to 30 days prior to departure will result in a 50% charge. There will be no refunds for cancellations 29 to 0 days before departure. Travel insurance is recommended. There are no refunds for delays and flight changes. Any unused services or package portions are non-refundable.
7. **Passports are necessary for entry into Roatán.** Write a letter to your students reminding them to obtain this document well in advance or renew theirs if it has expired. Passport must not expire within 6 months of departure date to Roatán.
8. If there is no course prior to the trip, a pre-departure class to introduce students to each other is recommended. This is also a good time to establish room assignments (4 per cabin). The rooms are not COED. If possible, have one meeting at a pool to practice snorkeling.
9. Make transportation arrangements for equipment needed for the course. Excess equipment can be sent down on a boat through one of several shipping companies. **These materials should be sent several weeks in advance to allow for unexpected ship delays.**
10. If travel arrangements are made through Bahia Tours, you should receive your tickets between 7 to 10 working days after your final payment has cleared. Groups are confirmed by Bahia Tours 30 days prior to departure. If tickets are purchased through another travel agent please **reconfirm your flight** at least 3 days before you leave.
11. Make sure all pieces of luggage have nametags on them. Bahia Tours will send you additional resort tags. Make sure one of these is attached to each bag. This will help us collect bags faster at baggage claim upon arrival.
12. Give out Packing List to students. **Please tell students to pack all the necessary articles in their carry on that they may need in the event a bag is delayed such as toiletries, medications, extra change of clothes and a BATHING SUIT etc.**



UPON ARRIVAL TO ROATÁN:

1. Please go through customs in one group. Outside of baggage claim, there will be a representative from Anthony's Key Resort to assist with your luggage and transportation to resort.
2. Upon arrival, your group will be escorted to the reception lounge of the resort. An orientation to the resort will be given after you fill out paperwork for diving and waivers of responsibility. A complimentary welcome drink is served. Room numbers will be given out and students will be directed to their rooms to unpack and settle in.
3. The Education Coordinator will be there to greet you. Most flights arrive in the afternoon or early evening so there are generally no activities scheduled for your arrival night unless requested. The itinerary can be reviewed and last minute questions can be answered. An orientation to the RIMS facility can be provided at this time although many groups opt to have it first thing the following morning.

PREPARING FOR DEPARTURE FROM ROATÁN:

1. Following the last dive, students will clean and return all rental equipment. Dive gear and other personal items will be removed from the labs and gear room. Any books, dive slates or other borrowed gear will be returned. We have developed a checkout policy for some of the equipment and all of the reference materials at RIMS. Students are responsible for replacing lost or damaged materials.
2. Any organisms collected during your visit will be returned and the aquaria and labs will be cleaned.
3. Room checkouts for each student are done the afternoon prior to a morning departure. Any room charges will be paid for at this time.
4. Transportation to the airport is provided. Departure from AKR is usually 3 hours before the plane departs. Have luggage ready for collection one hour prior to departure from the resort.

GETTING HERE:

One of the advantages of visiting RIMS is the accessibility of Roatán from major cities in the United States. The most common connections are through Houston, Dallas, Atlanta and Miami. United, American, Delta and Avianca all have direct flights on the weekend and fly non-direct flights to Roatán throughout the week. These flights generally land in San Pedro Sula on the mainland or in San Salvador, El Salvador, where connecting flights to Roatán are made.



Additional Information



CURRENCY: The Honduran currency is the Lempira. Currently the exchange rate is around 23.50 Lps. to \$1.00 U.S. All island businesses accept both US and Honduran currency, so there is no need to exchange money. Honduran banks can change American money into Lempiras. And AKR will also exchange dollars giving the bank's current rate of exchange. The exchange rate in the stores may be slightly less than the current bank rate.

CREDIT & DEBIT CARDS: Many places, including the resort, accept credit and debit cards. There are a few ATM machines on Roatán but they are often out of commission or pay out in Lempiras only. There will also likely be a small ATM fee to withdraw money depending on your bank. If you plan to use debit or credit cards remember to notify your bank of your travels. We do not accept personal checks and it is difficult to arrange a transfer of funds from abroad.

TAXES: Sales tax is 15% on most items (18% on tobacco & alcohol). Hotel tax is 4%. (Taxes are subject to change at anytime)

TIME: Honduras is on Central Standard Time and does not observe Daylight Savings.

ELECTRICITY: Our plugs and voltage (110V) is the same as the U.S. No adapters are required.

TELEPHONE: Most cell phones will work on the island if you have an international calling plan. Phones with Internet capability can use apps such as Skype, or WhatsApp, to text and communicate with friends and family at home.

INTERNET: Wireless Internet is provided through the resort and at RIMS at no cost however service can be unpredictable, and cut out at times due to weather and unforeseen forces. Our WiFi is accessible to all our guests so please be courteous and avoid large up- and downloads as the facility has limited bandwidth.

COMPUTERS: There is a computer available for shared use at the resort, and one at RIMS so it is highly recommended that you bring your own. We also recommend that you back-up your computer on an external hard drive BEFORE arriving to Roatán and do periodic back-ups during your stay. Flash drives may also be helpful for sharing journals, project material, documents, and presentations.



DRINKING WATER & ICE: Water at Anthony's Key Resort and RIMS is chlorinated and safe to drink from any tap. AKR possesses its own fresh water well and the water is treated according to U.S. standards to ensure a safe drinking supply during your stay. Bottled water available for purchase at the AKR snack shop and bar.

FOOD ALLERGIES & DIETARY RESTRICTIONS: AKR imports much of their food from the U.S. and maintains very strict sanitation standards in food preparation and storage. Meals are always fresh and delicious. Please let us know in advance if you have any food allergies or have any dietary restrictions so that we will be better able to accommodate your needs

LAUNDRY SERVICES: Off property laundry service is available. You can drop off your laundry at the snack shop in the morning and it will be ready for pick up in the afternoon. A medium size bag will cost about \$US 12.00. If you wish to do your own laundry please bring eco-friendly and biodegradable laundry detergent with you. We hang everything out on clothes-lines and let the sun and wind take care of the rest.

SECURITY: Guards are employed to patrol the resort and the RIMS facility day and night. While the resort staff is honest and trustworthy, there are several precautions you can take to ensure the safety of your belongings:

1. Keep your room locked **AT ALL TIMES** when unoccupied.
2. Keep valuables such as money, passports and plane tickets in the security boxes.
3. Remove all gear and personal items from the boat at the end of day.
4. Do not leave personal items left unattended on room decks or porches.

To prevent any misunderstandings regarding lost or misplaced items we suggest keeping the number of people invited into your rooms to a minimum.

TRANSPORTATION & LEAVING PROPERTY: A few daytime bus trips into town or to the local supermarket may be organized during the program. If evening outings are planned, we strongly recommend using the taxi service provided through the resort. While you may pay a bit more than hailing a taxi off the street, our drivers are officially licensed, reliable, safe and all speak English.

TIPPING POLICY: While tips are not mandatory, they are very much appreciated. The staff works extremely hard to make your experience amazing. If you would like to tip your boat captain and dive master in addition to the staff of AKR for doing a good job, the tips they receive are a very important supplemental source of income. Many groups factor in an additional fee into the total program cost to cover tipping. This often works better then trying to collect money from the students after they are here.



Packing for the Trip

Hindsight is always 20/20. Inevitably, some item is left at home that you regret not packing. Hopefully this list will eliminate that problem.

Documents:

Passport or Visa (required to enter and exit Honduras)

Dive Certification Card. Don't leave home without it!

Dive gear: (can be rented at the AKR scuba shop.)

Mask, fins and snorkel

Scuba gear (BCD & regulator)

Dive light

Dive skin or wet suit

Dive computer, camera and flashlight batteries

Class materials:

Pen and paper

Field journal

Field guides for identification of marine life*

Mesh bag to hold gear

Waterproof dive slate and pencil*

Personal items:

Closed-toed walking shoes

Sunscreen, waterproof (SPF 15 or higher)* **and Reef Safe!**

Sunglasses*

Hat*

Beach towel*

Bathing suits*

Waterproof bag

Underwater camera

Bug repellent*

Topical Analgesic/Antihistamine for bug bites - Benadryl *

Sunburn relief*- Solarcaine

Sudafed*

Seasickness medicine*

Imodium AD (liquid works best)*

Socks - to wear with fins to prevent blisters

Lightweight raincoat (especially November - February)

***These items can be purchased at the AKR scuba shop upon your arrival.**



Health Concerns While Abroad

The following pages offer information on medical concerns and healthcare recommendations to help make your stay more enjoyable.

Traveler's Diarrhea: Travel to rural areas and tropical climates may put a person at a higher risk for traveler's diarrhea, which is most often associated with a change in diet to the local fare. Water and ice can also be a source. While it can certainly cause discomfort, most cases are temporary and need not raise alarm. Diarrhea is however, the number one cause of dehydration, and must not be ignored. While there are various drugs that are used for the short-term treatment of diarrhea, replacement of fluids and electrolytes is the traditional therapy. It is very important to drink plenty of fluids if you experience diarrhea.

At the resort:

1. **All tap water at Anthony's Key Resort and RIMS is chlorinated and safe to drink.** The water is treated according to U.S. standards to ensure a safe drinking supply during your stay. There is also bottled water available for purchase at the AKR snack shop and bar.
2. AKR imports much of their food from the U.S. and maintains very strict sanitation standards in food preparation and storage. Meals are always fresh and delicious.

Outside of the resort:

1. Most restaurants and bars outside the resort cater to tourists & use purified water and ice.
2. Use caution when ordering from smaller establishments and roadside stands. Drink only bottled beverages or beverages made with boiled water.
3. Avoid raw seafood, rare meat or questionable dairy products.
4. Eat well-cooked foods while they are still hot.
5. Eat thoroughly cooked vegetables and fruits that can be peeled without contamination.
6. Carry anti-diarrhea medication.

Tetanus: If you're traveling to Honduras, an up-to-date tetanus shot is recommended.

Malaria: While cases of malaria have been reported on Roatán, the risk of contracting malaria for visitor's staying for short periods of time is very low. While not required, Chloroquine, taken orally once a week, is the most commonly prescribed anti-malarial medicine for travelers in Central America. Please consult your doctor concerning preventative medication.

Malaria is transmitted by the bite of an infected female *Anopheles* mosquito. Because of the nocturnal feeding habits of the *Anopheles* mosquito, malaria transmission occurs primarily between dusk and dawn. Keeping the body covered and using protective insect repellents on exposed skin provides adequate protection at these times. Effective repellents often contain N,N diethylmetatoluamide (DEET). We recommend not using a repellent with concentrations of DEET greater than 10% or using DEET containing repellants prior to entering the water. An effective all natural repellent called Cactus Juice is available locally.

For additional health information and immunizations for travel to Honduras, contact the Center for Disease Control's International Travelers website at

www.cdc.gov/travel

You and Your Well-Being – Preventative Measures

Attempts to maximize time on the reef and squeeze a heavy course curriculum into a few weeks may equate to long intensive days spent outdoors. Unfortunately this can cause you to ignore your body's natural limitations and ability to adapt to the changes in sun intensity, climate, diet and new marine environment. Regardless of the academic program being offered, all activities should be conducted with this in mind. Please make the following pages mandatory reading for students. Becoming aware of potential problems, and using a few preventative measures will make everyone's stay as productive and enjoyable as it should be.

Sunburn: Diving, snorkeling and working off a boat may make sun exposure unavoidable. The sun's rays are much stronger on Roatán and sunburn can occur quickly and be excruciatingly painful. Reduce sun exposure by using sunscreen, sunglasses, hats, and lip protection. A waterproof sunscreen with an SPF of 15 or stronger is recommended at all times. Oxybenzone, an ingredient in many commercial sunscreens, is harmful to corals. Please choose sunscreens without this ingredient. Look for a brand that uses physical sun blocks such as titanium dioxide and zinc oxide instead of chemical ones.

Motion Sickness: The waters off Roatán are generally calm and smooth. If conditions become less than ideal, or an individual is unusually susceptible to seasickness, motion sickness medication may be recommended. Medication should be taken at least an hour before getting on the boat to be effective. We suggest trying a drug on dry land to observe possible side effects before diving. NOTE: Medications of ANY kind should not be used while diving unless the user is aware of all possible adverse side effects.

Barotrauma: Ears & Sinuses: Ear problems can happen to the novice or experienced diver. Anytime you cannot relieve the full sensation or are in pain, stop descending immediately, and ascend a few feet. Serious ear injury or barotrauma can occur if a diver continues descent without equalizing adequately.

Please remember to equalize early and often! The best time to start equalizing is on the surface. During descent, equalize every few feet - before you feel pressure or fullness. Never wait until you are in pain. In short, when your ears tell you not to go, listen to them. They are the only two you will ever have!

Divers use a variety of methods to equalize their ears including:

- Jiggling the jaws.
- Swallowing, yawning or snorting into the mask.
- The Valsalva maneuver - pinching the nostrils, closing the mouth, and gently attempting to blow out or exhale.



Dehydration: An active schedule in the sun and in the water can increase the risk of a student becoming dehydrated. Symptoms of dehydration include nausea, fatigue, fever and migraines. Factors that increase your susceptibility to dehydration are:

- Profuse sweating.
- Breathing dry scuba air.
- Certain prescription drugs- Sudafed and Dramamine are 2 drugs often used by divers. Both of these drugs increase dehydration.
- Consumption of diuretics (like caffeine).
- Alcohol consumption - during metabolism of alcohol, a person's body uses up a great deal of water. A person with a hangover is very likely to be partially dehydrated.
- Diarrhea.

Preventing dehydration is extremely important for interns that are diving. Dehydration decreases the quantity of blood available for gas exchange, slows nitrogen removal from the body and increases the risk of decompression sickness despite careful dive planning.

Sand Flies: A small flying creature commonly called a “no-see-um” can distract from the fun and enjoyment a field trip to Roatán offers. These sand flies, true to their name are tiny, oft unseen insects. Their bites frequently go unnoticed until tiny red measles-like spots appear. While these spots are just visible nuisances in most cases, some unfortunate people have more severe reactions including welts and severe itching. Sand flies breed and flourish in warm, damp sands near the water and are most numerous on the beaches and docks. By taking a few early precautions, your trip can be bite free. Bug repellents provide very effective coverage against these insects. Wearing dive skins on the docks and boats can also cut down on exposure to these critters.

Cuts and Scrapes: As a final note, frequent immersion in salt water and the humidity associated with the tropics slows the healing process and encourages the growth of bacteria. Wounds should be tended to early and often. Remember: Prompt treatment is as important as appropriate treatment.



Diving Options & Gear Rental

If you would like the entire group to be dive certified there are several options available to you. You can arrange to have the students take the entire certification course in the U.S. or they can do all the lectures, written assignments and confined water sessions in the states and leave the open water work for down here. You can bring referrals to the resort and in two days the students can finish their certification. The last option is to do the entire certification down here. What better place to get certified then in the environment you plan to study. AKR is a Five Star PADI Instructor Development Center offering a full range of courses and certifications including Nitrox and one dozen specialties. Additional SCUBA information is available upon request.

A list of rental gear prices and rates for some courses are listed below. In addition, we have retail gear, although in limited supplies, that can be purchased at our Dive Shop.

ROATÁN INSTITUTE FOR MARINE SCIENCES Gear Rental & Dive Certification Rates

EQUIPMENT	Daily	Weekly
Mask, Fins & Snorkel	\$8.00	\$40.00
Mask & Snorkel	\$5.00	\$25.00
Fins	\$5.00	\$25.00
BCD	\$12.00	\$60.00
Regulator w/console and alternate air	\$10.00	\$50.00
Dive Computer	\$10.00	\$50.00
Regulator w/computer	\$16.00	\$80.00
Wet Suit (Full)	\$10.00	\$50.00
Wet Suit (Shorty)	\$8.00	\$40.00

Open Water Certification

Includes course material, equipment during course and fees \$375.00

Open Water Referral (PADI)

\$200.00

Open Water Referrals from OTHER Scuba associations

\$250.00

Includes open water portion leading to certification for those who have already completed classroom and confined sessions

Advanced Open Water Certification (PADI)

\$300.00

NITROX Certification

\$8 tank/ \$120.00 wk

Course and gear rental prices do not include 15% sales tax

Diver's Alert Network (DAN): DAN provides protection against dive-related injury or loss. For more information call: 1-800-446-2671 or contact www.diversalertnetwork.org

Suggested Reading Material

Humann, Paul: **Reef Fish Identification**
 Reef Creature Identification
 Reef Coral Identification

New World Publications, Inc. 1861 Cornell Rd, Jacksonville, Florida 32207.

The three-set fish, creature and coral ID books by Paul Humann is the unparalleled source for information on Caribbean marine life and identification. We have several sets here that will be available for use.

Caribbean Reef Life of the Bay Islands by Mickey Charteris

You can purchase his book online at <http://www.caribbeanreeflife.com/> There is also has an electronic version available for download. If you contact him online and let him know you are coming to RIMS on a student program he will give you a discount code for the purchase.

Depending on your field of study :

Life and Death of Coral Reefs by Charles Birkeland

Coral Reefs in the Anthropocene by Charles Birkeland

Corals in Space & Time by J.E.N. Vernon

The Ecology of Fishes on Coral Reefs by Peter Sale

Reef Evolution by Rachel Wood

Fish Behavior by Ned DeLoach

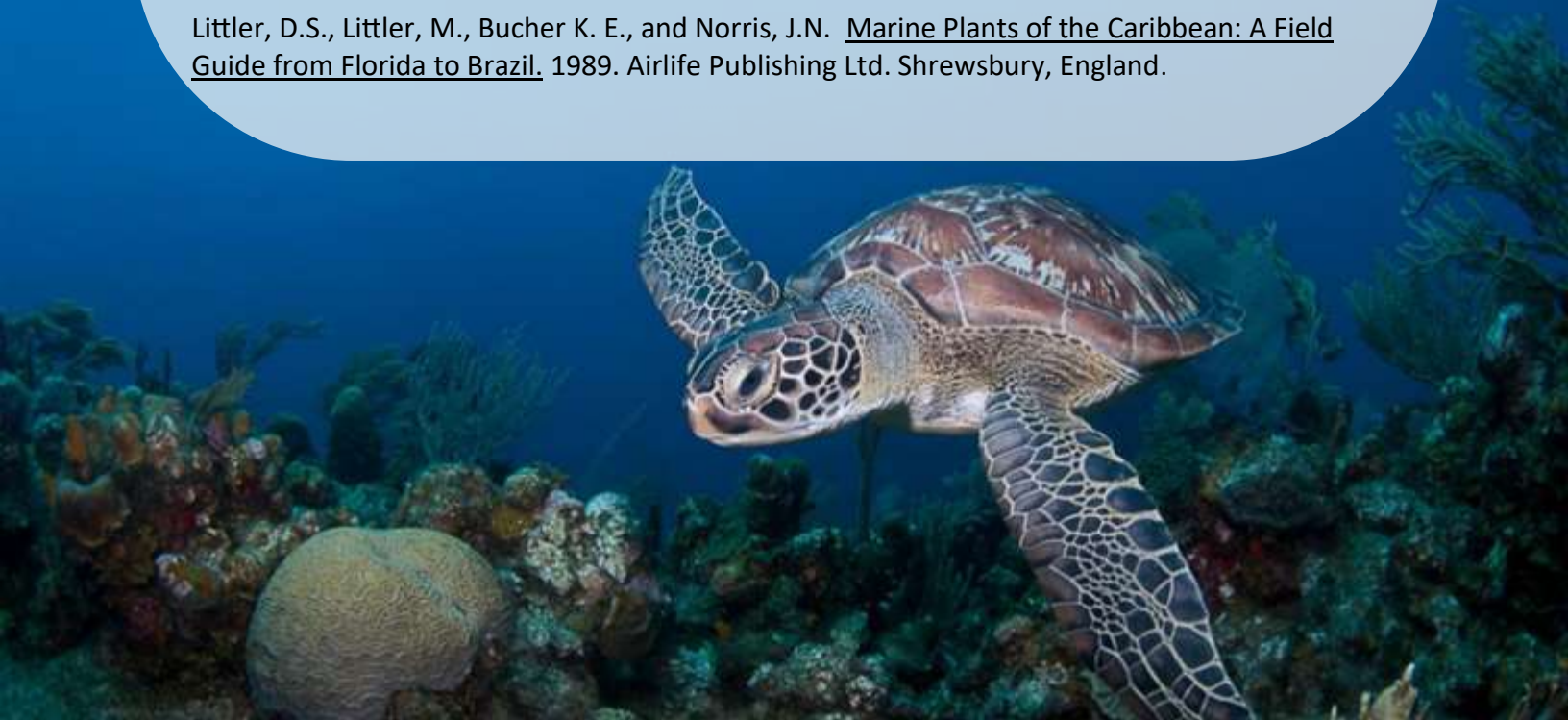
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Past Educational Groups

The following is a list of many of the institutions that have conducted education or research programs at RIMS.

Agnes Scott College
 Alabama School of Math and Sciences (HS)
 Arapahoe High School
 Berry College
 Birmingham Southern College
 Boise State University
 Broadreach (HS)
 Creighton University
 Eckerd College
 Goucher College
 Gulf Coast Research Laboratory
 Hastings College
 Iowa State University
 John Hopkins University
 La Sierra University
 Loyola Marymount University
 Lycoming College
 National Aquarium in Baltimore
 Nebraska Wesleyan College
 New College of South Florida
 Noble & Greenough (HS)
 North Central College
 North Collins Central (HS)
 Northland College
 Simpson College
 McClennan Community College
 Midland College
 Mystic Aquarium
 Onondaga Community College
 Peddie High School
 Purchase College
 Rhodes College
 Rider University
 Salisbury State University
 St. Lawrence Academy (HS)
 St Georges Academy (HS)
 Sonoma Academy (HS)
 Tennessee Aquarium
 University of Central Florida
 University of Kansas
 University of Louisville
 University of Minnesota
 University of Nebraska
 University of North Carolina-Wilmington
 University of Tampa
 University of South Florida
 Wallops Island Marine Consortium
 Wartburg College
 Worthington Christian (HS)
 Yale University



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CONTACT INFORMATION

For more information about the student program, please contact:

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Website: www.roatanims.org

For payment and travel plans, please contact our U.S. office at:

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BAHIA TOURS Booking Policies - Responsibility and Liability

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