

Ecology of Caribbean Termites

STUDENT CHALLENGE AWARDS PROGRAM

EXPEDITION BRIEFING

Team I: June 28 – July 13, 2006

Dear SCAP Participants,

We'd like to thank you for taking part in our research on the ecology of termites of the eastern Caribbean. In addition to contributing to science, you will gain valuable experience in field research techniques and exposure to life on a tropical island. We have been working in the Caribbean for over 10 years and are eager to share with you the excitement of discovery in the field, the tranquility of the tropics and the camaraderie that comes from daily interaction in the small-group setting of biological field stations.

The Virgin Islands Environmental Resource Station (VIERS) is located on the island of St. John, one of the three US Virgin Islands. Most of St. John is part of the US National Park system, making it one of the most pristine islands in the eastern Caribbean. The primary mission of VIERS is environmental education and research. The station is surrounded by dry tropical forest and is less than a five-minute walk to mangrove lagoons, wetlands and the ocean. Thus, it is perfectly situated for both terrestrial research and learning about the Caribbean environment. Aside from our SCAP team, the people you will be interacting with will include environmental educators, artists and other scientists.

When we meet this summer, you will be arriving on the bustling island of St. Thomas, home to the majority of Virgin Islands residents and the location of the capital city of Charlotte Amalie. As you exit the plane at the Cyril B. King Airport in St. Thomas, you will note the warm, humid, tropical air, and will likely be greeted by one of the local steel drum bands. After a night's stay on St. Thomas, we will transport you by taxi-van to the boat dock where we will catch the ferry to St. John. We will then take you by car to VIERS. After you've settled in, we'll give you an introduction to VIERS and a brief tour of the island before beginning our research. You will be awed by the island environment, charmed by the friendliness of the local residents of St. John, and amused by the lizards and land-crabs sharing your living quarters!

Working in the tropics is a thrill, but the thrill is in the discovery of natural processes and phenomena, which requires a lot of hard work. Searching for termites will require hiking through forests in the heat and spending hours in the laboratory. But, in doing so, you will experience things that most visitors to the islands never knew existed!

We'll see you soon!

Sincerely,

Claire A. Fuller, Ph.D.
Assistant Professor of Biology

Marielle Postava-Davignon
Ph.D Candidate

www.murraystate.edu

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Ecology of Caribbean Termites

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GENERAL INFORMATION

PRINCIPAL INVESTIGATORS: 1) **Claire A. Fuller, Ph.D.**
2) **Marielle A. Postava-Davignon**

POSITIONS/TITLES: 1) Associate Professor
2) Ph.D. Candidate

AFFILIATIONS: 1) Murray State University
2) Northeastern University

PROJECT TITLE: **Ecology of Caribbean Termites**

RESEARCH SITE: St. John, US Virgin Islands

TEAM DATES IN FIELD: Team I: June 28 – July 13, 2006

TEAM LENGTH: 16 days

TEAM SIZE: 6 students

THE EXPEDITION

1. PREPARING FOR YOUR EXPEDITION

In this Briefing

Preparation for your research expedition begins with careful review of this briefing, which includes important information on the logistics of your trip and on the work of professional scientists. Your assignment is to work under the direction of these scientists, enlisting your talents, initiative and exuberance to make the research effort a success.

- **Please consider this briefing required reading for participation on the project and bring it with you to the field**

It is presented in four main parts:

- 1) The Expedition
- 2) Daily Life in the Field
- 3) Travel Planning
- 4) The Research

These parts are broken down into specific and easy to understand sections, such as *Accommodations*, *Health Information* and *Team Itinerary*. Review the Table of Contents carefully and make sure you read each section.

A collaborative effort of Earthwatch Institute staff and the Principal Investigator(s), the briefing will answer your questions about travel, rendezvous, the research area, the living and working conditions you will encounter and the project staff with whom you will work. The overall objectives and methods of the research are described, as well as the specific tasks in which you will participate. It is possible that you may come across new words and phrases while reading through the research section, so it's a good idea to have a dictionary handy.

This briefing includes the most accurate information available at the time of your Principal Investigator's project planning, however, the precise work that you do may differ somewhat from that described. Please keep in mind that research requires improvisation. Research plans, especially in field research contexts, evolve in response to new findings as well as unpredictable factors such as rainstorms, equipment failures, politics, etc. The nature of research expeditions requires flexibility in plans and expectations. To maximize the success of your experience, remember to expect the unexpected, be tolerant of repetitive tasks, and try to find humor in difficult situations. We will keep you informed of any major changes in the research plan or field logistics before you go into the field.

Physical and Intellectual Preparation

In addition to reading and reviewing the briefing materials, we recommend extracurricular study and physical conditioning. Advance reading will enhance your understanding of the scientific questions addressed by the research. The briefing includes an optional reading list that can shorten your training time in the field. Some Principal Investigators include additional reading

material within the briefing; others will send you articles and/or provide printed information at the research site.

Pay attention to the *Project Conditions* section! Regular exercise is especially important for students who will be doing fieldwork. Your ability to quickly adapt to your project's physical demands will enhance both your enjoyment of the work and the productivity of your team. The briefing describes the physical demands of the project and may suggest specific activities for advance conditioning.

We encourage you to read novels or history books based in or near the research area of your expedition. Such stories will provide you with an interesting introduction to the location in which you will be living and working, and may help you "perceive" many unique features of the local culture and landscape.

Consider working on skills that will help you support, broaden and recall this research experience. For instance, we encourage students who will be participating in field biology research to take walks and to pay more attention to their surroundings. Begin developing the patience and observational skills of a scientist.

Journal writing: As a means of reflecting on this experience, you are encouraged to bring a journal to record your daily observations, thoughts, ideas, stories, drawings and/or feelings. You may also choose to take notes on scientific lectures, discussions and findings. Your observations and field notes can be just as important to the research team as those gathered by more experienced staff members. And whether you can draw or not, sketches of your observations will also help you remember your experiences and describe them to others.

Photography and art: Bring along your camera and/or art materials. Though research tasks take precedence and require focus, we encourage you to record your experience through photographs or drawings whenever working conditions allow.

In addition to print film for snapshots of new friends and beautiful scenery, consider using slide film and/or digital images. Action photos of your teammates working on a research task, of the research site and of the research subject provide important visuals for presentations. As stories develop out of your day-to-day experience, keep an eye out for images to illustrate these stories. If your expedition inspires any artwork that you are willing to share, Earthwatch Institute welcomes the opportunity to copy and use photographs, drawings, watercolors and cartoons in its various publications and online.

Emotional Preparation

Most likely, you will be working in a place you have never been before, with people you have just met, on tasks that require new knowledge and skills. Some aspects of your expedition, whether physical, social or intellectual, are bound to challenge you and prompt emotional highs and lows. Be mindful of these feelings and don't hesitate to communicate emotional concerns to the research staff.

The following sequence of feelings is typical:

- **Stage 1:** Everything is new and exciting; you feel terrific
- **Stage 2:** Disappointment in the reality of the situation; for instance, it has been raining for days and the work is more difficult than you expected it to be
- **Stage 3:** Your emotions reach an even plateau; things don't seem so rough, you understand the work and you feel you are making a contribution!

Being Part of a Team

Your team consists of a relatively small group of students and project staff. Many people are not used to the close living conditions and/or physical demands common to field research. The ability to get along with others is of paramount importance. Your expedition may include group activities, such as meal preparation and clean-up, which require as much teamwork as the research itself. At the start of your project, staff and students will establish ground rules that will ensure a fun, safe, respectful, inclusive and productive expedition experience for the whole team.

When abroad or in another part of the country, you are viewed as ambassadors of your home region. Be courteous and respectful of local customs as well as the diverse backgrounds and customs of your teammates. Your professionalism and general demeanor are important to your Principal Investigator(s), Earthwatch Institute and all teenage participants who may follow you. The poor judgment of one team member, for example violating program rules or possession of illegal drugs, could jeopardize the entire mission of this and future expeditions.

2. PROJECT OVERVIEW

"I never imagined fieldwork could be so much fun and constructive at the same time. This expedition has fueled my passion for biological sciences and I cannot wait to get into the field to conduct research of my own."

~ Mary Shellie Bailey, 2004 SCAP participant

Termite colonies (100,000 or more individual termites living in one nest) are one of the primary forces degrading woody debris in tropical ecosystems. They recycle nutrients back into soils where plants have access to them. Therefore, tropical termites are extremely important in the overall health of these ecosystems and factors affecting their populations can have ramifications for the entire habitat.

This project focuses on the role of parasites in the ecology of tropical termites. We are examining one arboreal termite species in five different habitats on St. John: mangrove, sparse vegetation, wetlands, dry forest and moist forest. We have followed the behavior and ecology of marked colonies for the past decade to determine how parasites and the termites' environment affect their evolutionary fitness (colony growth, reproduction and survival). We continue to monitor these colonies each year; however, our focus has shifted to determining how the environment affects immunity and susceptibility to disease. Last summer, we found that the immunity of termites increases as colony size increases and immunity also changes with environmental temperature and humidity. We have also begun to monitor the microbial communities present within and surrounding the nests, and have already observed some significant differences in the quantities and varieties of microbes present in the different environments. We will explore these relationships further this summer.

Student Challenge Awards Program (SCAP) participants will be involved in an ongoing study in which over 100 termite colonies in different habitats all over St. John are being monitored for growth, reproduction and survival. In addition, you will contribute to a new study to determine the effects of colony size and environmental parameters (temperature, moisture, light levels, etc.) on the ability of termites to ward off other pathogens. You may also quantify the microbial communities within and surrounding a colony by collecting termite, nest, and soil samples, washing the samples, and plating the washes on agar plates. Students will expose termites to fungal pathogens to determine susceptibility and will also measure immunity directly.

3. RESEARCH AREA

St. John is located east of Puerto Rico in the Caribbean Sea and is part of a chain of islands that form the US and British Virgin Islands. It is a dry tropical island approximately eight miles long and one mile wide. Two-thirds of the island and its surrounding waters is a national park, thus much of the original fauna and flora is intact. It is an especially interesting island from an ecological standpoint because it consists of a wide variety of terrestrial and marine habitats in a relatively small space. There are tropical moist forests at high elevation, tropical dry forests surrounding them, and habitats with wind-exposed scrub and sparse vegetation at low elevation. Thus, in a matter of minutes, students can travel from a lush tropical forest to areas where the majority of the vegetation is cactus and agave. The marine environment is also diverse and easily accessible from shore. Snorkelers can find rocky and coral reefs, seagrass beds, and extensive sand flats from most beaches. Air temperatures average in the upper 70s°F at night and upper

80s°F during the day. Water temperature during the summer averages above 80°F. See Section 11 'Project Conditions' for more information on the environment in which you will be working.

St. John has a population of approximately 5,000 people, mostly descendants of slaves brought to the islands during the 1700s. The culture is quite different than what most students encounter at home. Life tends to be slow paced and people quite friendly. Islanders usually dress conservatively and appreciate it when tourists do the same. When we are in camp or in town, we wear t-shirts and shorts (no bikini tops!). The local language (English) is spoken with a very different accent than you find stateside, and it often takes a while to understand what people are saying. Just ask politely for clarification! Behave as you would at home: be polite, respect people around you, and if you are unsure how to behave in a situation, ask.

See Section 16 'Helpful Resources' for websites with more information about VIERS, St. John and the US Virgin Islands.

4. PROJECT STAFF

Principal Investigators

Dr. Claire A. Fuller was born in 1959 in Chicago, Illinois. She received her B.A. in General Biology from the University of California at San Diego, and her M.S. and Ph.D. in Zoology from Oregon State University. She spent her junior year abroad in Germany and speaks fluent German. Her specialization is in parasite-host ecology and population biology. She has taught and conducted research at the University of the Virgin Islands on St. Thomas (1995-1996) and the University of Texas at El Paso (1997). She has been at Murray State University since the fall of 1997, and is currently an Associate Professor of Biology. Claire's career highlights include presentations at numerous scientific meetings, publications in peer-reviewed journals, grants funded by multiple organizations (e.g. Earthwatch, the National Science Foundation and the US Geological Survey), acting as a Panel Member for the Science Education Forum at the 2005 Earthwatch Institute Annual Meeting, being nominated for the Murray State University Outstanding Teacher Award, and acting as a Faculty Mentor for the TriBeta Biological Honors Society for Undergraduates. Her hobbies/interests include pottery, reading (mainly current literature and science fiction), dog walking and watching lots of soccer. She is the proud mom of Niko (age 13) and Aaron (age 7). Her responsibilities during the project will include making onsite arrangements, overseeing research and supervising students. She has worked with termites in the Caribbean since 1996 and has taken four SCAP groups to St. John.

Marielle Postava-Davignon was born in 1980 in Englewood, NJ. She received her B.S. in Biology from SUNY Fredonia, and is currently pursuing her Ph.D. in Biology from Northeastern University. Her dissertation research focuses mainly on how termite nest architecture influences susceptibility to disease, as well as the role that pathogens played in the evolution of nest architecture. She has assisted in the St. John SCAP expeditions for the past two years, and also performs summer field research in Panama at the Smithsonian Tropical Research Institute. In addition to her research, she also works as a Teaching Assistant for Anatomy and Physiology labs at Northeastern, and is a fellow for the NSF funded K-12 program for which she assists in a high school biology class at the Health Careers Academy in Boston. Marielle's favorite hobbies are watching movies and hiking, and she likes to have a good time no matter what task she undertakes. Her primary responsibilities during the project will be overseeing research and supervising students.

DAILY LIFE IN THE FIELD

5. TEAM ITINERARY

Day 1:	Rendezvous and stay overnight on St. Thomas; there may be a brief tour of the University of the Virgin Islands
Day 2:	Travel to VIERS on St. John by ferry, arriving in the early afternoon; settle in and introduction to rules and regulations at VIERS; tour of the island and introduction to the study organisms and study sites; practice some of the data collection techniques
Days 3-6:	Field and laboratory work
Day 7:	Carnival!
Days 8-11:	Field and laboratory work
Day 12:	Half-day field trip, half-day data collection
Day 13:	Wrap-up data collection and begin data analysis
Day 14:	Complete data analysis and presentation of results
Day 15:	Clean-up and packing; depart to St. Thomas where we'll stay overnight
Day 16:	Departure to airport for flights home

You'll be visiting one of the most beautiful places on the planet, with pristine tropical forest and two Caribbean bays at your doorstep. While many people visit these islands as tourists, you will be involved in a process of discovery that is intellectually challenging and often physically demanding. As a result, your experience will be far more rewarding and you will witness things in the natural environment of which most people have never even dreamed.

Like any team, a productive research group requires a positive attitude and a sense of camaraderie among team members. Working together in the field and sharing the process of discovery will foster group cohesion. In addition, the team will share meals and clean-up duties, chats around the campfire, and other types of fun, including a day at St. John Carnival, dinner at the world-famous Skinny Legs outdoor café, and a movie night at VIERS' theater (a wood hut with a VCR/DVD player).

The atmosphere at VIERS fosters an appreciation for and curiosity about the natural environment, which will surely rub off on you. While the investigators are professionally hard working, they are personally laid back and very approachable. Thus, you will quickly view VIERS and the Virgin Islands National Park as a home you won't want to leave.

6. DAILY SCHEDULE AND TASKS

The work schedule will be based largely on results and accomplishments during previous work sessions, and will therefore be highly variable. Some work will be conducted during the evenings. Additionally, we travel to field sites all over the island in rented vehicles (jeeps or trucks) on a daily basis. The island is small (eight miles long) but the roads are slow, so we spend up to 1.5 hours driving each day. Your flexibility, cooperation and understanding are appreciated. The schedule below is tentative.

7:00 am:	Breakfast
8:00 am:	Leave for field on field days, data entry or side trip on non-field days
12:00 pm:	Lunch break
1:00 pm:	Back to fieldwork on field days, data analysis or side trip on non-field days
3:30 pm:	Break
6:00 pm:	Dinner
7:00 pm:	Sort termites or lab work on field days, free time or activity on non-field days

7. FIELD TRAINING AND ASSIGNMENTS

VIERS' primary mission is environmental education, and the staff and layout of the facility greatly facilitate group interaction. Very little training is necessary for much of this study. Students can learn to distinguish termite ages and castes in less than an hour. You will learn how to measure and sample nests the first day in the field. Measurements of immune parameters require more sophisticated equipment and a bit more practice with pipettes, etc. However, the techniques are also easy to learn and students will conduct assays under supervision of the PIs.

Students will spend the first few days completing nest surveys. We will drive and hike all over St. John revisiting marked colonies. During surveys we will measure the physical environment (light, pH, soil temperature, etc.) around each colony. We will install data loggers that continuously record temperature and relative humidity in and next to 10 colonies. We will move these data loggers to 10 new colonies every few days throughout the expedition.

After the first few days, three students will work most closely with Marielle and three with Claire. In this way, students will have their own projects for which they have primary responsibility.

Marielle will lead three students in collecting termites, nest, trail, and soil samples from different habitats and "washing" each sample with a mild detergent that dislodges the microbes. The washes from each colony are plated on potato dextrose agar plates and incubated for five days, at which time we will count the number of bacterial and fungal colonies that have grown. In this way we will be able to compare the microbial communities in different parts of the nest (core vs. trail), on different caste members (workers vs. soldiers), as well as the different habitats.

Claire will lead three students in collecting termites from colonies of different sizes and living in different microhabitats (different temperature and humidity) to examine their immune response to an inert substance (a tiny nylon bead) injected into their body cavity. This group will also expose collected termites to an entomopathogenic fungus (insect fungus) to determine whether differences in immunological parameters measured above have "real world" implications.

All students will also work together to design a group website, which is an important part of your expedition. The website will be a place within Earthwatch's general website where thousands of visitors can experience your project. Consider how your group's website will not only record your experience, but also function to educate others and empower them to make public policy decisions relevant to your research.

8. ACCOMMODATIONS

Researchers and students will be housed in two-room, screened-in cabins. Students will be housed in groups of up to four, in all-male and all-female cabins. Each room sleeps from three to six people in single beds and is equipped with ceiling fans. Cabins are arranged in a circle around an open area where leisure activities take place (campfires, basketball, volleyball, socializing, etc.). Students are responsible for maintaining their own cabins (i.e. making beds and sweeping). Bathing and toilet facilities are shared by all students, researchers and staff (there are all-male and all-female facilities). Because St. John is a dry island and water for washing comes from rain, showers are limited to three minutes per day. Toilets are flush toilets. To conserve water, we follow this well-known saying: "In the land of fun and sun, we never flush for number one!"

Blankets will be provided, but you should bring your own sheets, pillowcase, towels and toiletries. We can make a trip to the local laundromat if necessary. Electricity is less reliable at VIERS than you might be used to. There are often power failures. If you have equipment that could be damaged by power disruption, don't bring it. Also, please don't bring a TV or boom-box. A personal music player with earphones is fine, digital cameras and video cameras are great, but keep in mind that heat, humidity, salt, and sand are enemies of electronics.

9. FOOD

Breakfast and most dinners are prepared by VIERS staff. The SCAP team will prepare lunch (usually sandwiches) and often take it along to the field in coolers. We will eat two dinners out and will prepare two dinners ourselves in the PI cabin. You will be expected to help clean up the kitchen after meals. Clean-up includes washing dishes, wiping down surfaces, and sweeping.

Here is a sampling of foods you can expect during your expedition:

- Breakfast:** Cereal, toast, eggs, pancakes, fruit
- Lunch:** Sandwiches, fruit, chips, yogurt
- Dinner:** Chicken and fish with rice, pasta, tacos, lasagna, salad, bread, dessert
- Snacks:** Bring your own favorite snacks (sodas, chips, cookies, candy and ice cream bars are available from the cantina for a small fee)
- Beverages:** Milk, water, juice, coffee, tea, iced tea, lemonade

Special Dietary Requirements

Please alert Student Awards Coordinator Annie Madio to any special dietary requirements as soon as possible. There is usually enough variety in the food that VIERS has on hand to accommodate a vegetarian diet. Lactose-intolerant diets can be accommodated with no problem. If you adhere to a vegan diet, you can purchase food in Cruz Bay, St. John and make simple meals for yourself. The stores are 20-40 minutes from VIERS and the team may only get there 2-3 times, so you'll have to plan ahead. Also, food on the island costs close to twice mainland prices.

TRAVEL PLANNING

10. BEFORE YOU LEAVE

Passport Information

By now, you've been notified by Annie Madio that you will need a passport valid for at least six months beyond your expedition.

Suggested Passport Agency

- PassportVisaExpress.com
1911 North Fort Myer Drive, Suite 503
Arlington, VA 22209
Tel: +1 888 596-6028, +1 703 351-0992
Fax: +1 703 351-0995
Email: info@passportvisaexpress.com
Website: <http://www.passportvisaexpress.com>

Participants Under 18 Years of Age

In an effort to prevent international child abduction many governments have initiated procedures at entry/exit points. Many countries require all persons under the age of 18 to have a notarized letter from all legal guardians stipulating that the person under 18 can travel unaccompanied or in the presence of only one guardian. This letter must give an explanation for why only one parent or someone other than a parent is signing the letter. For example, if one parent is deceased, only one parent has legal guardianship, or someone other than the parents are legal guardians, the letter should state that.

In addition, airlines may also have documentation requirements for unaccompanied minors. Parents of minors are responsible for checking with each airline that their child will be flying to ensure that sufficient documentation is provided. This could include a copy of a birth certificate or a notarized letter stating that the minor has his or her parent's permission to travel alone.

Note: Requirements by specific countries and airlines vary and change frequently. You **MUST** keep informed of the requirements on your own to avoid problems at immigration. If a letter is not available, the student under 18 can be refused entry into the country. There is nothing Earthwatch Institute can do to help in this circumstance.

International Evacuation Insurance

All students who are awarded a Student Challenge Awards Program expedition are automatically covered under the standard CEGA Group plan (described below) for travel, medical and evacuation insurance.

The travel medical and evacuation insurance, coordinated by CEGA Group, is mandatory for Earthwatch participants while on an Earthwatch expedition anywhere in the world. The insurance covers travel medical risk, including medical expenses and medical evacuation, while traveling with Earthwatch overseas or on an expedition within your home country. CEGA Group

will also facilitate evacuation from the project site in the event of an emergency. Without insurance, the costs of such measures can be on the order of US\$20,000 to \$50,000.

CEGA Group provides a 24-hour emergency hotline for the use of insured persons under the Earthwatch program and can help with medical emergencies, doctor and hospital selection, obtaining additional medical options or medical translation problems. CEGA Group is backed by International SOS and Global Medical Management, who provide emergency medical evacuation and rescue services. The Earthwatch policy certificate number is US 0113. In addition, each individual policy is identified by the participant's Earthwatch ID number, shown above your name on your team list.

In an emergency - If you are calling from **outside of the US**, the number to call is: +44 (20) 8762 8015. You may call this number collect/reverse charges.

In an emergency - If you are calling from **inside the US**, the toll-free number to call is: +1 888 422-4747.

Basic coverage is valid in the country of your Earthwatch expedition and during international travel to and from your expedition. If the expedition takes place in your home country, coverage begins when your group forms for the expedition and ends when the group disbands, and is incremental to your existing health insurance. Options are available for students who would like to purchase additional baggage insurance. Please contact Annie Madio (Tel: +1 800 776-0188 ext. 116) for more information.

Personal Funds

Students should plan to bring US\$200-300 for snacks, postcards, souvenirs, etc. St. John is a US island and uses standard US currency. Credit cards are accepted virtually everywhere, as are most types of traveler's checks. There are ATM machines available approximately 40 minutes from VIERS and the team will pass by them a few times a week. The ATMs do run out of cash on occasion (like during Carnival).

Travel Arrangements

Earthwatch Institute will be working with Tzell New England Travel Specialists to make your plane reservations. We will send an itinerary to you for your approval – **please examine it closely!** When you have approved the itinerary, Tzell will mail your plane tickets (hard copy or e-tickets) with the confirmed/final travel itinerary two to three weeks in advance of your departure for the research site. You need only concern yourself with getting to the nearest airport to your home (and back). Please plan to arrive to the airport two to three hours before your flight.

In the event of any unforeseen change in your travel plans after you have received the itinerary, please call Annie Madio at Earthwatch at +1 800 776-0188 ext. 116 or +1 978 450-1259 as soon as possible. Please also alert your Principal Investigator.

If you need last-minute help and can't reach Earthwatch, call Tzell directly to resolve any problems with your travel itinerary. Our contact at Tzell is:

- **Maurice Hebert**
Tzell New England Travel Specialists
20 Melrose Street
Boston, Massachusetts 02116
Tel: +1 617 422-5000
Email: MHebert@Tzell.com

Problems in Transit

If you need additional help and it's during regular business hours (Monday through Friday, 9:00-5:00 EST), these are numbers you can call:

- Annie Madio +1 978 450-1259
- Earthwatch Institute +1 978 461-0081 or +800 776-0188

Lost Luggage

Lost luggage is a recurrent problem for travelers, whether taking short domestic flights or journeys around the globe. Earthwatch recommends that you **take a carry-on bag with a set of field clothes and shoes, plus any personal essentials**, so that you will not be uncomfortable or incapacitated if your baggage takes several days to catch up with you.

Out-of-Pocket Travel Expenses

Earthwatch Institute covers the cost of your travel to participate in your expedition. This includes travel to the rendezvous site as well as from the rendezvous to the research site.

We advise carrying a credit card or US\$200-300 in traveler's checks in case you experience interruptions in your travel. Earthwatch will reimburse you for any unexpected costs incurred as a result of unforeseen circumstances while traveling to and from the research site. To receive reimbursement, just save your travel receipts and send them, with a narrative report, to Annie Madio at Earthwatch Institute within 30 days of your return.

Confirming Your Flights

Prior to travel, take a few minutes to confirm your flights with the airlines. Sometimes flight numbers change, or departure times, and we need you to keep on top of it! **Airlines don't always notify you of these changes.** Here are websites for many airlines' flight status information pages.

- Air Canada: www.aircanada.com/en/travelinfo/traveller/flightstatus/index.html?src=hp_ql
- Alaska Air: www.alaskaair.com/airport/flightstatus/flifostart.asp
- America West: fly.americawest.com/awa/flifo/default.aspx
- American Airlines: www.aa.com/apps/travelInformation/SearchGatesTimesandStatus.jhtml?anchorEvent=false
- Calm Air: www.calmair.com/main/index.htm
- Continental Airlines: www.continental.com/travel/tcFlightAndGate.asp
- Delta Airlines: www.delta.com/travel/before/travel_updates_flight_info/index.jsp
- Northwest Air: www.nwa.com/travel/flifo/
- Pacific Coastal: www.pacificcoastal.com/index.php
- Southwest Air: www.southwest.com/cgi-bin/selectFlight
- United Airlines: www.united.com/page/middlepage/0,6823,1030,00.html
- US Airways: fs.usairways.com/abs/flightStatus.do?sessionId=002EBE85C38CBF0C299ECB8C9D9BC854

Other Advice / Information

- *Electricity*: Same as in US
- *Time zone*: Atlantic Time Zone

11. PROJECT CONDITIONS

Please show this section to your physician when he/she is completing your health statement. Be sure to discuss inoculation requirements with your physician well in advance of your departure date. See Section 12 'Health Information' for inoculation information.

To the examining physician:

Your patient has volunteered to join a field research team that has specific physical demands of which you and your patient should be aware. **We need your accurate evaluation of your patient's ability to meet the conditions detailed below in order to safeguard his/her health and safety and ensure that he/she can participate fully and effectively.**

General Conditions of the Research Site

The terrestrial terrain is hilly and the weather is warm and typically humid. The ocean water is warm, and typically calm and clear. There are two rainy seasons, one in early fall and one in late winter/early spring. The team will not be on St. John during a rainy season; however, there may be days when it rains heavily.

Humidity	25%	to	100%
Temperature range	70°F/21°C	to	95°F/35°C
Altitude	0 ft/m	to	1800 ft/548 m
Rainfall	Up to 3 in/7 cm	per	day

Water Conditions

Snorkeling is optional, but there will be opportunities nearly every day for recreational snorkeling. It is recommended that students participate to fully appreciate the Caribbean.

Typical water temperature	78°F/25.5°C	to	82°F/27.8°C
Typical water visibility	20 ft/6 m	to	100 ft/33 m
Typical water depth in snorkeling area	5 ft/1.5 m	to	20 ft/6 m
Anticipated depth of snorkeling	0 ft/m	to	15 ft/5 m
Anticipated number of snorkel trips per day	2	to	3

Physical Demands

The two major physical demands of the project are hiking on steep hillsides and spending time in the heat and humidity, but if you are in decent shape you shouldn't have problems. You should be able to walk at a quick pace up a fair grade of approximately five percent for 20-30 minutes in the heat. In addition, the team often pushes through underbrush and is exposed to ants, wasps and thorns. Termites bite, too, but not hard.

The information provided below is as accurate as possible, but please keep in mind that conditions may change once in the field and the project could potentially be more or less strenuous than the chart indicates.

Activity	Workload/Intensity
Sitting	2 hours per day
Bending	1 hour per day
Hiking	1 hour per day over 2 mi/3 km
Walking	2 hours per day over 2 mi/3 km
Carrying	5 lb/2.2 kg for 3 hours per day

Potential Hazards

The general risks on St. John include excessive sun exposure (sunburn and dehydration and bites/stings by jellyfish, spiders and insects). In addition, there are dangers inherent to all water activities (drowning), however, we swim in very calm bays for leisure activities (off hours at Lameshur Bay and lunch breaks while collecting termites away from VIERS).

Hazard Type	Associated Risks and Precautions
Transportation	We travel on winding roads every day. People susceptible to severe motion sickness can have problems so bring medication.
Terrain	Trails are rocky and some have steep drop-offs, so there is a possibility of slipping/tripping and becoming injured. It is important to wear appropriate hiking shoes/boots and to watch where you step. We usually go on two longer hikes (1-2 hours) during the expedition.
Animals/Plants	We will be exposed to wasps and fire ants although we generally are able to avoid them. Much of the vegetation on St. John is thorny and there is the famous “death apple tree” that we will point out. Fire coral, jelly fish and other stinging animals may be present during snorkeling (optional).
Climate/Weather	We will remind people during the first few days to drink water, wear sunscreen, and watch for sunstroke signs on companions. Dehydration can be an issue so we bring plenty of water. While the project will overlap with the beginning of hurricane season, hurricanes are rare during this time of year and we have plenty of warning.
Personal security	Although St. John is relatively safe, precautions against theft are recommended. For example, don’t carry more money than you think you will need on a given day (for snacks or souvenirs) and carry the money in a safe place. Theft of cameras and other valuable items is common on St. John, and tourists are especially susceptible. Do not take cameras or large amounts of cash to field sites, and do not leave valuables on the beach. Note that the project has never had a problem with theft at VIERS, so bring your cameras to St. John and the team will make special trips to take photos.
Disease	Diseases found in tropical regions include malaria, dengue fever, filariasis, leishmaniasis, onchocerciasis, trypanosomiasis, schistosomiasis, hepatitis, and typhoid. Please see Section 12 ‘Health Information’ for inoculation recommendations. Most diseases are prevented with basic safety cautions. Please see the CDC (www.cdc.gov) or WHO (www.who.int) websites for more information.

Medical Conditions of Special Concern

Conditions or limitations that would make participation on this project difficult or uncomfortable include: any condition that interferes with or limits breathing, vertigo, anemia, hypertension, epilepsy, seizures, scarred lung tissue, sickle cell disease, blood clotting issues, heart and kidney problems, limited mobility (e.g. neck, back or knee injuries), and specific allergies. If you suffer from motion or seasickness and intend to treat this with either over-the-counter or prescribed medication, please discuss the use and side effects with your physician. Phobias of insects may also be problematic, as we encounter them frequently, especially spiders. If the phobia is extreme, full participation would be difficult.

12. HEALTH INFORMATION

All participants should make sure to have the following up-to-date immunizations: DPT (diphtheria, pertussis, tetanus), polio, MMR (measles, mumps, rubella) and varicella (if you have not already had chicken pox). Other standard immunizations common in some countries may include HIB (haemophilus influenza), pneumococcal, meningococcal, influenza and hepatitis B. Medical decisions are the responsibility of each student. Note that health conditions around the world are constantly changing, so keep informed and consult your physician, a local travel health clinic, the US Center for Disease Control (www.cdc.gov), the World Health Organization (WHO) (www.who.int) or the resources in Section 16 'Helpful Resources' for the latest health information.

13. PACKING CONSIDERATIONS

PLEASE BRING THIS EXPEDITION BRIEFING WITH YOU ON YOUR EXPEDITION, AS WELL AS THE PACKING CHECKLIST LOCATED AT THE BACK OF THE BRIEFING.

General Considerations

Do not bring more luggage than you can carry and handle on your own. We recommend that you pack a carry-on bag with an extra set of field clothing and personal essentials in the event that your luggage is lost and/or takes several days to catch up with you. If you find that assembling what you'll need to participate on this project poses financial hardship, please contact Student Awards Coordinator Annie Madio.

Weather Considerations

Please take into consideration the weather conditions during your team when packing for your expedition. Climate information can be found in Section 11 'Project Conditions.' Remember that the sun is strong and bring appropriate clothing, sunscreen, and a hat.

Essential Items

Make sure to bring your Earthwatch Expedition Briefing with you! It includes essential information to which you may need to refer during your expedition, as well as during your journey to and from the project site. Also remember to bring along the journal that was sent to you. **Please see the Expedition Packing Checklist for a complete list of what you will need to take with you.** We recommend going through the list with a pen or pencil and marking off each required item right before you leave for your expedition. This list conveniently tears out from the briefing, so you can take it with you when shopping and preparing for your expedition. Make sure to bring the list with you on your expedition so you can check it again before you return home!

14. RECOMMENDED READING

Please read the material included in the *Selected Reading* section of this briefing. Also recommended is the book *St. John, Off the Beaten Track* by Gerald Singer (Sombrero Publishing Company). This book can be purchased online through popular vendors. See Section 16 'Helpful Resources' for suggested vendor websites.

15. EMERGENCIES IN THE FIELD

Minor injuries (e.g. cuts, stings) can be treated at VIERS with available First Aid equipment or by the National Park Rangers. For more serious injuries, a vehicle will be available at all times to transport students to the medical clinic at Cruz Bay (about a 40-minute drive). For the most serious injuries, patients can be taken by boat or helicopter to the Roy L. Schneider Hospital on St. Thomas. VIERS' staff has phones that can be used to contact emergency personnel.

Please bring your health insurance card to expedite treatment in the unlikely event that you need to receive medical treatment.

Staff certified in safety	VIERS Manager Scott McCoy: CPR, First Aid, Water Safety, Wilderness Response Dr. Fuller: First Aid
Nearest hospital	Roy Schneider Hospital 9048 Sugar Estate St. Thomas, USVI 00802 Tel: +1 340 776-8311
Time to reach	2.5 hours

16. HELPFUL RESOURCES

Project-related and Principal Investigator Websites

- Clean Islands International: www.islands.org
- PI Claire Fuller's site:
<http://campus.murraystate.edu/academic/faculty/claire.fuller/website.htm>

Travel Guidebooks and Booksellers

- Lonely Planet travel guidebooks and online travel site: <http://www.lonelyplanet.com>.
- The Rough Guide travel guidebooks and online travel site:
<http://travel.roughguides.com/>
- Amazon: <http://www.amazon.com>
- Barnes and Noble: <http://www.bn.com>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>

Country Information

- Virgin Islands and St. John sites:
<http://www.islands.org/virgin/viers/>
<http://www.islandways.com/>
<http://www.stjohnusvi.com/stjohn.html>
<http://www.usvi.net/>
- National Geographic Map Machine:
<http://plasma.nationalgeographic.com/mapmachine>
- US State Department: <http://www.state.gov/>
- World Time Server: <http://www.worldtimeserver.com/> (time worldwide with GMT/UTC) or <http://worldbuddy.com>
- Telephone dialing from and to anywhere: <http://kropla.com/dialcode.htm>
- Online unit conversions: <http://www.onlineconversion.com>

- ATM locator:
<http://visa.via.infonow.net/locator/global/jsp/SearchPage.jsp>
<http://www.mastercard.com/atmlocator/index.jsp>
- Heat index (temperature, dewpoint and relative humidity):
<http://www.weatherimages.org/data/heatindex.html>
- Exhaustive list of weather resources: <http://cirrus.sprl.umich.edu/wxnet/servers.html>

Health Information

- US Travel Clinic Directory: <http://www.astmh.org/scripts/clinindex.asp>
- Travel Health website: <http://www.mdtravelhealth.com>
- Center for Disease Control: <http://www.cdc.gov>
Tel: +1 800 311-3435 or +1 888 232-3228
- World Health Organization: <http://www.who.int>
- Disease Outbreaks: <http://www.who.int/csr/don/en/>

Marine Information

- SCUBA Medical Information: <http://www.scubadiving.com/training/medicine>
- Dive Master Insurance Consultants Ltd.: <http://www.dive-master.net>

THE RESEARCH

17. BACKGROUND, OBJECTIVES AND METHODS

Background

This research project examines the effect of abiotic environmental parameters on the *Nasutitermes acajutlae* termite species in five different habitats (mangrove lagoon, sparse vegetation, wetlands, dry forest and moist forest) on St. John.

Termites in the genus *Nasutitermes* have three main castes: workers, soldiers and reproductives. *Nasutitermes acajutlae* colonies build one large nest and covered trails to foraging sites. The reproductives generally remain inside the nest. However, winged reproductives (alates) leave the colony together on one night a year to form new colonies. Soldiers and workers travel via the foraging trails to foraging sites. *Nasutitermes* soldiers have reduced mandibles and modified head capsules that squirt sticky terpenoid defense compounds. They cannot directly ingest wood and are fed by workers. Workers forage, feed all other caste members including immatures, build galleries and nests and remove dead and dying termites.

Objectives and Methods

Comparing Growth, Reproduction and Survival of Termite Colonies

We have surveyed growth, survival and reproduction in over 100 termite colonies yearly since 1998, and have found significant differences in survival and reproduction in colonies among habitats. However, we are just beginning to see long-term patterns in some aspects of termite population dynamics. We are now collecting data on the abiotic environment (temperature, relative humidity, pH, etc.) to correlate with colony success. For example, last year we measured daytime high and nighttime low temperatures inside nests and in the environment simultaneously. We found that reproductive colonies are significantly warmer than non-reproductive colonies. Internal temperature change is negatively related to external temperature, meaning colonies in hot environments cool down at night. The question remains: why don't all colonies keep themselves warm if reproduction is related to warmth? We believe the answer may have to do with relative humidity. Colonies in cooler (humid) environments can remain hot without becoming too dry, while colonies in hot (dry) environments may need to cool down to avoid drying out.

In 2006, we will test this hypothesis by using data loggers to record temperature and RH inside and outside the nests continuously. Students will measure previously-marked termite colonies with a tree caliper and take core samples to determine whether colonies are alive and producing alates – the animals that disperse to form new colonies. A data logger will be placed in the hole left by the corer and hole will be plugged with soil. A second data logger will be taped to the tree in which the nest resides. We will return a few days later to download the data onto a computer and move the data loggers to new nests.

Quantifying and Comparing Microbial Communities

Microbes such as fungi and bacteria serve as important pathogenic pressures that may have influenced the evolution of social behavior in termites. Some termites of the genus *Nasutitermes*, including *N. acajutlae*, have evolved to nest within living trees rather than in microbially-rich decaying wood or soil. Data collected from St. John in 2004 and 2005 with the help of SCAP participants have shown that the quantity of microbes residing on the cuticle of the termites varies depending on whether the individual was collected from the core of a nest, or from one of the trails surrounding the nest.

In 2006, we will examine the microbial community of the nest and trail material itself, as well as the soil surrounding the nest. A better understanding of the microbial community will allow us to infer whether pathogens played a role in the evolution of arboreal nesting behavior, and whether it influences the survival of nests in different environments. Students will collect samples of termites, nest and trail material from the nests surveyed, as well as soil from the base of the tree each nest is in. Microbes will be collected from the samples and will be incubated at ambient temperature (~25-30°C). Following incubation, all bacterial and fungal colonies larger than one millimeter will be counted.

Examining the Effect of Soldier Secretions in Inhibiting Specific Fungal Species

Fungi are important competitors and pathogens of termites. During the last three field seasons, SCAP participants have conducted a project to determine whether soldiers inhibit fungal growth. We found that soldier secretions inhibit fungal growth and secretions seem to be effective against a wide variety of fungi. However, we have not yet examined the inhibitory effect on specific fungal species.

In 2006, students will follow up on the earlier findings. We will use seven fungal strains that we isolated in 2005 from termites and are currently being maintained by the USDA ARSEF lab. We have found that secretions from five macerated soldiers inhibit fungal growth. Thus, we will add secretions from five soldiers to various concentrations of fungal spores of each of the seven fungal strains isolated in 2005. Trials for all fungal species will be replicated using soldiers from 20 different termite colonies. Controls will consist of spores that have not been exposed to soldiers.

Determining Levels of Immunity among Termite Reproductives from Different Colonies

During the 2004 and 2005 field seasons we collected data showing that one component of insect immunity increases with colony size and decreases with environmental temperature in termite workers. We will extend these results during 2006, examining how immunity among reproductives (nymphs and alates) varies with habitat and environment. This avenue is particularly promising for two reasons: first, we have already shown that reproduction varies by habitat, and second, a number of studies in insects have shown a trade-off in energy allocation between immunity and reproduction.

Phenyloxidase (PO) is an enzyme present in hemolymph (blood) that produces melanin, a toxic compound that is an integral part of invertebrate immune systems. PO activity can be easily measured. First, a precursor molecule (in our work, L-Dopa) to melanin is added to hemolymph. The PO in the hemolymph changes the precursor to a compound called quinone, and this new molecule converts to melanin over the next several hours. In solution, L-Dopa forms a clear liquid while quinone solution is orange. Therefore, it is possible to measure how quickly L-Dopa is changed to quinone by measuring the increase in orange in a hemolymph solution. The rate of the reaction is an indicator of PO activity. Students will extract hemolymph from termite reproductives, add the precursor to each hemolymph sample, and then place the solution on a

microtiter plate reader. This machine measures the increase in orange color at various time intervals. The rate of the reaction is determined for each termite by obtaining the slope of the equation for the change in orange (optical density) over time. We will also measure susceptibility of termites to fungal pathogens by exposing soldiers and workers from different colonies to a pathogenic fungus and measuring survival.

18. RESULTS AND OPPORTUNITIES

This study addresses basic questions in evolutionary, behavioral and population ecology of termites. Termites are responsible for as much as 30 percent of the recycling of woody debris into soil in the tropics, thus are a key component of these ecosystems. Termites are affected by a large number of pathogens and immunity may be temperature dependent. Because of changing environments, especially temperature regimes due to global warming, termites may undergo large-scale changes. In our view, sound management and conservation policies stem from the understanding gained by basic research on the relationship between organisms and their environment, and the sharing of that information with both scientific and lay communities. Our data are shared with scientists and managers from the US National Park Service on St. John, as well as other visitors (K-12 students and eco-tourists) to VIERS. We publish in mainstream scientific journals and make presentations to both scientific and lay audiences.

EXPEDITION PACKING CHECKLIST

Essential Items

- THIS EXPEDITION BRIEFING!
- Photocopies of your passport, flight itinerary and credit cards in case the originals are lost or stolen; the copies should be packed separately from the original documents
- The journal that was sent to you
- Your health insurance card
- Passport

Required Items

If you find that assembling what you'll need to participate on this project poses financial hardship, please contact Student Awards Coordinator Annie Madio to discuss your options.

Clothing/Footwear for Fieldwork

Note: Bring clothing that you don't mind getting dirty and possibly ruining.

- 3-4 pairs of shorts (if you prefer to wear long pants in the field, expect them to get very dirty)
- Several short-sleeved t-shirts and/or tank tops
- Well worn-in and comfortable hiking shoes or hiking boots

Clothing/Footwear for Leisure

- 1-2 nice, modest sets of clothing for evening in town
- 1 set of warmer clothing, including a light jacket, for travel
- Sandals
- Running shoes
- 1-2 swimming suits

Field Supplies

- Small daypack/rucksack
- Drybag or plastic sealable bags (e.g. Ziploc) for protecting equipment such as camera from dust, humidity, and water
- Insect repellent spray
- 1-liter water bottle(s)
- Waterproof/resistant digital watch with alarm and stopwatch features (if you intend to snorkel during the expedition, this should be waterproof to at least 100 meters)

Bedding and Bathing

- Single sheet set, including pillow case
- Bath and/or beach towel(s)

Personal Supplies

- Personal toiletries (we recommend bringing biodegradable soaps and shampoos)
- Antibacterial wipes or lotion (good for “washing” hands while in the field)
- Personal First Aid kit (e.g. anti-diarrhea pills, antibiotics, antiseptic, itch-relief, pain reliever, bandages, blister covers, etc.) and personal medications
- Sunscreen lotion with SPF 30 or higher

Miscellaneous

- Spending money (approximately US\$200-300 in a combination of traveler’s checks and cash)
- Phone cards for use with payphones
- Battery or wind-up alarm clock (your watch may also work as an alarm)
- Flashlight

Optional Items

Note: While mask, fins and snorkel are optional, this equipment will open up daily opportunities for recreational snorkeling and is highly recommended to make the most of the Caribbean.

- Snorkel
- Snorkel mask (make sure to get a GOOD quality mask)
- Fins, preferably with a back strap rather than a boot-foot, so they can be worn with dive booties/surf shoes
- Diving booties for walking over rock and dead coral
- Long-sleeved shirt for protection while snorkeling
- Camera, film, extra camera battery (rechargeable is fine)
- Personal CD player with earphones (NOT to be used during project activities)
- Earplugs
- Books, field guides, games, etc. for leisure time
- Sketch book and art supplies
- DVD movie to watch with the team at VIERS