

**Information from last year's briefing is included below.
Please keep in mind that these sections may change.**

General Information

Climate Change and Caterpillars in Ecuador

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Research Site: Yanayacu Biological Station, Ecuador

The Research

Climate Change and Caterpillars in Ecuador



THE STORY

The *Climate Change and Caterpillars* project in Ecuador examines factors that affect interactions among plants, caterpillars, and their natural enemies. This is an important area of study for both agricultural and basic ecology. This three-tiered study system allows for insights into “tri-trophic” interactions—in other words, it examines the relationships among three distinct levels of the food web. You will conduct caterpillar research in the deserts and mountains around the Southwest Research Station in the Chiricahua Mountains and the nearby Santa Rita Experimental Range in the Coronado National Forest. Other Earthwatch teams conduct work throughout the year in forests and mountains in Nevada and California; a rainforest at La Selva Biological Station in Costa Rica; a cloud forest at Yanayacu Biological Station in Ecuador; and in urban areas, swamps, and bottomland hardwood forests around New Orleans, Louisiana.

The natural enemies of caterpillars that the project studies are called “parasitoids.” They include many species of wasps and flies that kill caterpillars by depositing their eggs on them. This ensures that the parasitoids’ offspring will have both a safe environment in which to grow (inside the caterpillar) and a good supply of food (caterpillar tissue). We are rearing caterpillars of over 300 species and recording the mortality caused by the parasitoids. In addition, we isolate specific chemical compounds from some species of caterpillars and food plants to examine them as potential defenses against parasitoids.

By comparing the results from different sites, we can test hypotheses about the effects of climate on interactions between caterpillars and parasitoids. Our study also collects essential natural history information about plants, caterpillars, and parasitoids. Based on our data, we are developing models to predict which parasitoids might be used to control specific insect pests of human crops, which will benefit farmers who are attempting to control pests without using pesticides. Some of the species that we study (such as army worms and owl butterfly caterpillars) are agricultural pests; others (such as some rare day flying moths) are threatened by habitat loss and fragmentation.

The caterpillars you'll work with are fascinating: they come in a spectacular diversity of shapes, colors, and forms that function to defend them against their enemies. Many of the species found by this project will be new to science.

RESEARCH AIMS

To effectively protect and manage diminishing natural ecosystems, we need as much information as possible about the interactions of organisms within ecosystems, especially organisms as diverse and important as parasitoids. Our most significant accomplishment is the compilation of natural history data on approximately 9,500 species of caterpillars, plants, and parasitoids (from all sites). We are sharing this information both with other scientists and with local communities; for example, we work with local schoolteachers and high school students to help them incorporate the results from this project into their classes.

The project is also studying the effect of climate change on the interactions among plants, caterpillars, and parasitoids. Global climate change includes both increases in average temperature and atmospheric carbon dioxide content and increased climatic unpredictability and variability (such as floods and droughts). To address the first effect of climate change, we have shown by laboratory experiments that increases in the temperature and carbon dioxide content of the air-changes that are occurring worldwide-caused dramatic decreases in the rates of parasitism by increasing caterpillar development rates enough to allow the caterpillars to pupate before the parasitoids could finish their development. The reduction in parasitism in turn caused an increase in the population of caterpillars and thus a decrease in the biomass of the plants that they ate. To address the second effect, we have compared data from our sites and 11 other sites in the Americas and found that the intensity of parasitism decreased as year-to-year variation in total precipitation increased. We hypothesize that this decline is caused by the disruption of synchronization between the life cycles of caterpillars and their parasitoids so that the caterpillars are unavailable to specialized parasitoids during their host- searching phase. Our research thus suggests that global climate change may result in decreases in the intensity of attacks by parasitoids and hence increases in caterpillar populations.

HOW YOU WILL HELP

All of the teams at the five research locations have the same duties and spend plenty of time in the forest gathering and identifying caterpillars and food plants and conducting experiments, as well as time in the laboratory raising caterpillars and working on chemical analyses. You will be involved with most aspects of the project. The project especially welcomes anyone with computer and web design skills.

You will spend about 70% of your time in the field searching for caterpillars, collecting host plants, collecting material for laboratory or computer analyses, and conducting experiments. Searching for caterpillars in the forest is very straightforward, and you will be given plenty of tips on how to find them. Host plant collection involves hiking to previously located sites of host plants and gathering leaves to feed to caterpillars being reared in the laboratory.

You will spend the rest of your time (about 30%) in the lab entering data, computer work, and helping to rear caterpillars. Rearing caterpillars involves placing them in clean bags, checking them for parasitoids, moving pupae to different bags, and collecting adults or parasitoids from the bags. Adults are either released or preserved for further identification. The station has a laboratory as well as an outdoor tent for caterpillar rearing, which has lines for hanging caterpillar bags, tables for processing and observing caterpillars, and great views.

Your Destination

About Ecuador

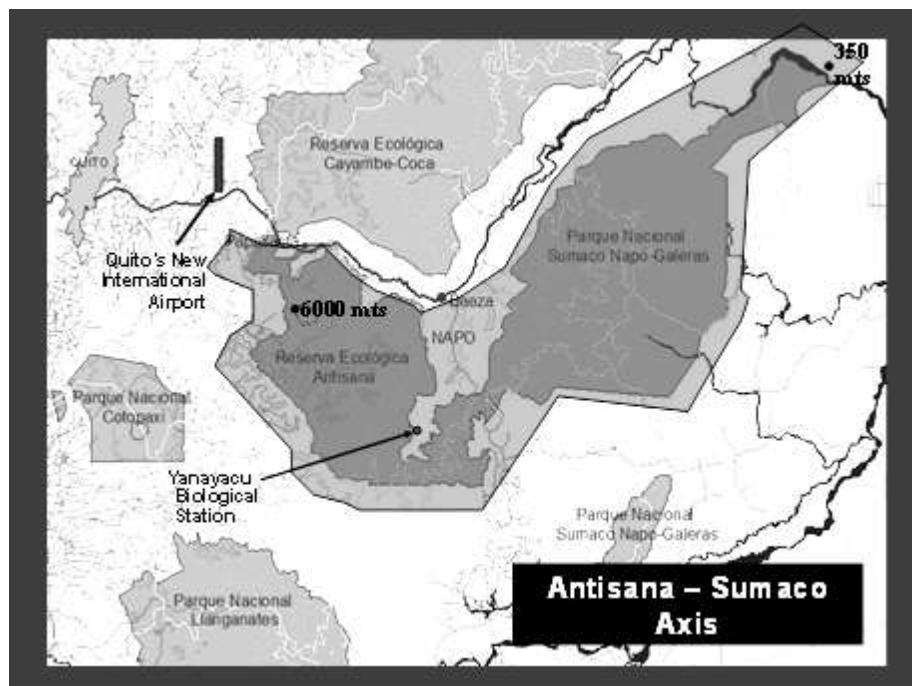
PHYSICAL ENVIRONMENT

Biological diversity is very high in Ecuador, one of the few countries labeled “megadiverse.” There are 320 known species of mammals, 350 species of reptiles, over 375 species of amphibians, and over 1,550 species of birds. Insect diversity is also extremely high and is not yet well studied; butterfly inventories in specific regions of Ecuador have revealed remarkable species diversity. There are between 22,000 and 25,000 species of plants, and a great diversity of species reside near the reserve where you will work. However, a variety of factors, including cattle ranching, timber harvesting, and oil exploration, have resulted in serious environmental degradation in this country.

The Yanayacu Biological Station and Center for Creative Studies (www.yanayacu.org) is situated at the equator on the eastern slope of the Andes, three to four hours from Quito via a dirt road (Las Caucheras). The station is in the Napo Province near the town of Cosanga, which is on the road from Baeza to Tena. There are large tracts of good forest here (1,000 hectares each) and a lot of secondary growth along roadsides—perfect for collecting caterpillars. Most of the forest of the eastern Andes has huge inclines, and you will see a lot of landslides. Yanayacu is unique in the area, however, because it is a cloud forest lacking such extreme inclines. Behind the private reserve is the Antisana Reserve, an immense wildlife refuge that includes numerous Paramo sites (an ecological zone consisting of high alpine tundra found only in the Andes).

CULTURAL, SOCIAL, AND POLITICAL ENVIRONMENT

Ecuador is a democratic republic with executive, legislative, and judicial branches of government and 11 political parties. The constitution provides for concurrent four-year terms of office for the President, Vice President, and members of Congress. US currency became legal tender in Ecuador in 2000; the previous currency, the sucre, has been eliminated. The major agricultural products include bananas, coffee, cacao, sugar, rice, dairy products, and corn, while the major industries include petroleum, timber, and pharmaceuticals.





Project Conditions

The Field Environment

GENERAL CONDITIONS

The information that follows is as accurate as possible, but please keep in mind that conditions may change.

Yanayacu is at 2,100 meters (nearly 7,000 feet) above sea level on the eastern slope of the Andes. The trails along which volunteers will work can be quite steep and muddy with many tripping hazards. While many visitors assume that the area will be hot due to Ecuador's location on the equator, the altitude, high humidity, and frequent rain can actually make it quite cold. Due to the rain and the presence of steep mountainsides, landslides are common and may delay work and travel.

Temperatures vary between the range below, often in one day, so you should bring clothing you can layer. The humidity causes cool temperatures to feel lower, and you will want warm clothing for the evenings and early mornings. Also, be prepared for lots of non-stop rain and bring fast-drying clothing.

JULY CONDITIONS

Humidity: 90% to 100%

Temperature Range: 10°C/50°F to 29°C/85°F

Rainfall: 76 cm/29 in to 508 cm/200 in

ELIGIBILITY REQUIREMENTS

All participants must be able to:

- Follow verbal and or visual instructions.
- Traverse uneven, unstable, steep and/or muddy terrain carrying a light pack for up to 0.8 – 8 km (0.5 – 5 miles) per day, for 8 days. At times, volunteers will need to hike off trail through dense undergrowth, or uphill on slippery vegetation.
- Enjoy being outdoors all day in all types of weather (see above), which may include variable temperatures, frequent rain, and high humidity.
- Enjoy being outdoors in the potential presence of wild animals, snakes, and insects. Spiders and snakes are ubiquitous in the forest and can also appear in laboratories and rooms.
- Carry personal daily supplies, such as water, lunch, and camera.
- Tolerate living at high altitude.
- Get low enough to access and collect samples on the ground and in the brush.
- Sit during data entry, zoo, or laboratory tasks for up to 2 to 3 hours per day for 8 days.
- Sit and ride, with seatbelt fastened, in a project vehicle or hired bus for up to approximately three hours per day when traveling to and from Quito to the field site. Some team members may travel to more distant sites in a project vehicle.
- Tolerate heights in order to travel comfortably along very steep drop-offs in buses and project vehicles.
- Live comfortably at a small and sometimes very active research station for the length of the project (bring earplugs in order to sleep comfortably if necessary).
- Live comfortably without electricity throughout the night for the length of the project.



POTENTIAL HAZARDS

Hazard Type	Associated Risks and Precautions
Transportation	The Ecuadorian road system can be risky by Western standards due to fast and reckless drivers, rain, poor or no lighting, and poor road conditions. The bus ride from Quito to Yanayacu takes a wet, winding mountain road that is very steep in sections, has long unpaved sections, and is subject to landslides. Driving at night will be avoided. Seat belt use is required whenever possible. Volunteers are not permitted to drive.
Terrain	The trails where volunteers will collect caterpillars are steep, muddy and slippery. Wear appropriate footwear (hiking boots with ankle support or Wellington boots with good tread). Always walk slowly and carefully, be aware of your surroundings, and heed staff instructions. Hiking can be as strenuous or easy as you feel is appropriate, since caterpillars can be found everywhere.
Altitude Sickness	Different people react in different ways to working at high altitude. Even people who are very fit at sea level can find themselves struggling as they walk at higher altitudes. Take the first few days slowly (project staff will provide activities that require less exertion at the beginning of the expedition), and report any illness (headache, lethargy, appetite loss, nausea, etc.) to staff immediately. Also remain well hydrated. The sun is strong at these altitudes, so a high factor sun cream and protective clothing (wide-brimmed hat, sunglasses, long sleeves) are essential. If you have any condition that might be affected by increased sun exposure or if you are sensitive to heat, please consult a physician. Many common prescription medications can increase your sensitivity to sun and heat. Illnesses that may be aggravated by altitude include sickle cell anemia and chronic heart and lung diseases. Those with asthma or other breathing problems may experience altitude related discomfort and may wish to consult with their doctors in advance.
Animals/ Insects	There are no large, dangerous animals or poisonous snakes in the area. There are few biting and stinging insects, but some visitors choose to bring insect repellent to ward off the occasional mosquito. Anyone allergic to wasp, bee, or ant stings should bring medications as appropriate with them (e.g., at least two EpiPens).
Plants	Some plants are poisonous and can cause rashes, and others have thorns. Wear long sleeves to avoid scratches when walking through the forest and take care when touching forest flora.
Climate/ Weather	Due to the altitude, the climate, and the demanding nature of the research activities, take care to avoid dehydration. Always carry and drink plenty of water throughout the day, and get enough to eat. Do not overexert yourself. Inform a staff member right away if you feel tired or ill. There will be a lot of rain, so bring appropriate gear. The risk of sunburn is also high; bring a wide-brimmed hat, sunscreen (30 SPF or higher), and appropriate clothing. Because of the high humidity, people who use hearing aids may find that they don't work properly. You should consider purchasing a hearing aid dehumidifier.
Political/ Social/Cultural	Roads are sometimes closed due to protests in the area. These protests do not generally pose a risk, but should be avoided wherever possible.
Project Tasks/ Equipment	Volunteers will use pruning clippers. You will be instructed in their proper use to minimize the risk of injury.
Personal Security	Take personal safety precautions while traveling both before and after the expedition. Use common sense in urban centers (Quito, Tena, Guayaquil) due to the risk of petty or violent crime. Avoid traveling alone and displaying money or other valuables, use caution when withdrawing money from ATMs, take taxis, and avoid traveling at night. When walking in Quito, do not walk with a big backpack; use small bags, and consider putting your money inside your shoe. A money belt or waist pouch is also highly recommended (neck pouches are not as they can be easily spotted). It is always best practice to leave unnecessary valuables at home. Take caution in tourist areas and crowded marketplaces. In Quito, in

	particular, the old city center, city parks, Virgin of the Panecillo (El Panecillo) shrine, Calle Morales (often referred to as Calle La Ronda), El Tejar, Parroquia San Sebastián (old city), Gonzalez Suarez (old city), Avenida Cristóbal Colón (new city), and the districts of La Mariscal, La Carolina, La Floresta, and La Marin should be avoided at night due to the high risk of petty crime. Also avoid hiking in the areas surrounding the antennas of Volcan Pichincha and the Teleferico (cable car).
	At the project site, do not wander off by yourself. It is possible to get lost, and the temperature, rainfall, and dampness can make this uncomfortable and dangerous.
Disease	All volunteers should see a travel doctor before leaving to discuss immunizations and other precautions to take against tropical diseases. See the Health Information section.

Safety

Health Information

ROUTINE IMMUNIZATIONS

All volunteers should 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). Please be sure your tetanus shot is current.

Medical decisions are the responsibility of each volunteer and his or her doctor, and the following are recommendations only. Earthwatch can only provide details regarding suggested vaccinations, and we are not a medical organization.

PROJECT VACCINATIONS

REQUIRED: If traveling from countries or region where yellow fever is endemic, you must have a certificate of vaccination.

RECOMMENDED FOR HEALTH REASONS: Typhoid, hepatitis A, hepatitis B

ADVICE REGARDING DISEASES

Traveler's diarrhea affects many international travelers.

Diseases found in Ecuador include malaria, dengue fever, typhoid, filariasis, leishmaniasis, onchocerciasis, trypanosomiasis, schistosomiasis, and viral encephalitis. Please see the U.S. Centers for Disease Control and Prevention (www.cdc.gov) or the World Health Organization (www.who.int/) websites for more information on these conditions and how to avoid them.

You can decrease your risk of most diseases above by avoiding mosquito bites, practicing good hygiene, and drinking only bottled or filtered water when appropriate.

If you feel ill once you return from your trip, make sure you inform your doctor that you have recently returned from a tropical region.

A few notes on vaccinations and treatment:

- **Malaria:** Though not present in the research area, it is in other parts of Ecuador. Chloroquine-resistant malaria exists throughout the year in most areas of Ecuador with an altitude below 1,500 meters (4,921 feet). There is no known risk in the cities of Guayaquil or Quito, or in the Galapagos Islands. Volunteers traveling elsewhere in Ecuador should consult their physician or travel health provider for advice on malarial prophylaxis.
- **Tuberculosis:** Volunteers returning from developing countries may wish to have a (PPD)-tuberculin skin-test to screen for potential infection.

EMERGENCIES IN THE FIELD

A station vehicle will be available to provide emergency transportation if necessary. The injured/ill individual would be quickly and safely transported to the closest facility (Baeza) by the Earthwatch scientist or staff. There is also a small medical clinic in the town of Cosanga for minor issues that is 25 minutes away by vehicle. If an emergency phone call is necessary, the call will be placed from Cosanga. The station vehicle will also be used in the event that a volunteer needs to leave the expedition early for a personal emergency. The Earthwatch scientist will drive the volunteer to Quito (note that volunteers may leave early ONLY in cases of emergency).

NEAREST HOSPITAL

Baeza State Hospital/Baeza Health Center

Rio Coca 5 y 5 de Marzo, Barrio 14 de Mayo Ciudadela Nueva Andalucia, Quijos

Baeza, Napo, Ecuador

Tel: +593 (06) 232-0443

One hour away by vehicle

