

Butterflies of Vietnam

EXPEDITION BRIEFING

Team I: May 13 - 21, 2006

Team II: June 15 - 23, 2006

Team III: July 14 - 22, 2006

Team IV: August 14 - 22, 2006

Team V: September 15 - 23, 2006

Team VI: October 6 - 14, 2006

Team VII: October 28 - November 5, 2006

Dear Prospective Volunteers,

I am Vu Van Lien, an entomologist from Vietnam. I would like to welcome you to our project, surveying butterflies at Tam Dao National Park, North Vietnam. I have been surveying butterflies and other aspects of tropical forest diversity in Vietnam since 1994. I would ideally like to investigate what butterfly populations can tell us about the ecological viability of Tam Dao's luxuriant hillside forest with your help.

Tam Dao National Park, located in North Vietnam and just 75 km from Hanoi, is an important natural protected area of Vietnam. The area of the park is 35,000 ha, and it is an attractive tourist site due to its mild climate and beautiful landscape. So far we have discovered 350 species of butterflies in this park, a remnant island of lush tropical rainforest in a sea of agricultural development. Research and conservation of butterflies in this area is essential, especially because a large number of them have been over-collected, which can lead to their extinction. There are many colorful and valuable butterflies occurring in the park; these insects are also sensitive indicators of ecological change. Thanks to their astounding diversity, high visibility, short life cycles, and specialized host-plant requirements, butterflies can provide a vital window into the health of an ecosystem. That window is desperately needed for Tam Dao, beset by a growing population and a history of furious exploitation for valuable timber, wildlife, and slash and burn agriculture. It is also helpful to establish butterfly farms based on data of butterfly food plants. The highly valuable species being collected and traded can be reared in butterfly farms at Tam Dao in order to return cash to local people to reduce poverty, which is one of the biggest problems for conservation of wildlife in Vietnam.

Using internationally established methods, you can help us monitor butterflies as an ecological indicator of habitat change, from agricultural development to more subtle shifts in the balance of nature, and monitor the long-term changes of butterfly populations overtime. The butterfly fauna of Vietnam are still relatively unknown, and new species and subspecies are being discovered annually. With your help, we hope to find species that could be used as eco-indicators of different levels of forest disturbance and actual changes of butterfly abundance temporally.

You will rise relatively early to walk a series of transects, counting all butterflies you can identify by sight and catching those that you do not recognize for later identification. These surveys will last 5-7 hours a day between 8:30 am and 6:00 pm. You will develop the skills needed to recognize many stunning butterflies by wings, from giant birdwings to effervescent whites, and will try your hand at more nondescript skippers, blues, and coppers. You will help take pictures of butterflies, caterpillars and food plants, and may collect butterfly specimens outside transects to develop a comprehensive species list for the park. Not only will your efforts establish a baseline survey to quickly and easily evaluate future disturbances, but they will also identify butterfly species that are threatened and would benefit from conservation efforts.

You will be met by me or other Vietnamese staff at in Hanoi. At Tam Dao we will stay at a hotel with shared rooms, hot showers, refrigerator and television. Meals will be served at the hotel, where you can find both traditional Vietnamese, Asian and Western style foods. In your spare time you can hike to local peaks, visit an open market, walk around the town, visit local temples and waterfalls, bird watch, enjoy local cultural events, sing karaoke, go to an internet cafe or discotheque, get a massage, and so on. In addition, you will have a chance to visit other famous sites and areas throughout Vietnam. A peaceful, exciting and mysterious land with hospitable people is waiting for you.

We are really looking forward to meeting you in Vietnam and having help from you. Thank you so much for contributing your time and money to supporting our research project.

Sincerely yours,

Vu Van Lien

Butterflies of Vietnam

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GENERAL INFORMATION

PRINCIPAL INVESTIGATOR: **Vu Van Lien**

POSITION/TITLE: Researcher

AFFILIATION: Vietnam Russia Tropical Center

PROJECT TITLE: **Butterflies of Vietnam:** Using butterflies as ecological indicators of habitat disturbance and monitoring butterfly species populations over time

RESEARCH SITE: Tam Dao National Park, North Vietnam

TEAM DATES IN FIELD:

Team I:	May 13 – 21, 2006
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Team VII:	October 28 – November 5, 2006

TEAM LENGTH: 9 days

TEAM SIZE: Minimum: 2 Maximum: 7

MINIMUM AGE OF PARTICIPATION: 16 (see Section 9 '*Before You Leave*' for important information)

THE EXPEDITION

1. PROJECT OVERVIEW

In Vietnam, a large area of forest has been lost and this loss is still occurring. Due to the high growth rate of the human population and increased economic development, there has been high pressure on natural resources. Although forests in protected areas are conserved, human activities such as logging and taking fuel wood still occur there. Habitat disturbance and fragmentation are two of the principal causes that have led many species of plants and animals in general, and butterflies in particular, to become endangered or threatened. In the past, many butterflies were seen flying both outside and within the forests, but in recent times fewer butterflies have been seen.

Butterflies and moths are members of the insect order Lepidoptera (from the Greek “lepis,” meaning “scale,” and “pteron,” meaning “wing”). Scales cover their bodies and wings, overlapping like roof tiles and giving the wings colors and patterns. Butterflies are an abundant and diverse group of animals and a conspicuous part of virtually all of the world’s terrestrial ecosystems (New 1997). There are about 19,445 species in 1,231 genera that consist of 11% of species of Lepidoptera (Schappert 2000). Butterflies, like many insects, have four distinct stages in their life cycles: egg, caterpillar, pupa, and adult. They appeal to people in a unique way, and in the popular mind, people often separate “butterflies” from “insects,” as if these are different groups of animals. Studying and watching butterflies perhaps ranks second only to ornithology as a pastime for naturalists interested in animal life (Pyle 1992). Unlike most other insects, even their closest relatives the moths, butterflies are accepted readily as aesthetically and culturally desirable (New 1997). They are seen as being intrinsically worthy of protection. Conservation of butterflies is also a field of increasing interest in many parts of the world. It is important to communicate the need for invertebrate conservation to people who might not otherwise be sympathetic to it. Butterflies are an important flagship group for advocacy of invertebrates – a bridge between the publicly acceptable world of conserving mammals and birds, and the widespread antagonism toward, or lack of interest in, the mass of less conspicuous animals that dominate our natural world (New 1997).

Butterflies are sensitive to the environment, and help warn us about unhealthy changes that are taking place. So far many species have declined markedly in abundance or have become extinct due to environmental pollution, habitat disturbance, and loss of vegetation as a consequence of human activities. Many species of butterflies are now far less abundant or widely distributed than they used to be, and declines of some have been precisely documented. An investigation in The Netherlands showed that the distribution and abundance of many Dutch species of butterflies has decreased sharply (Geraedts 1986); of 71 native species, 15 have become extinct. Investigations in other nations also show that several species’ populations have declined (Pollard and Yates 1992, Yata 1996, Ishii 1996). As with other groups of animals, many of these declines can be attributed directly to human influences.

It has been increasingly apparent that ecological disturbance is a frequent and important process in tropical forest environments. Tropical forest communities have changed in composition and abundance over time due to forest procession and weather condition as well as habitat fragmentation and disturbance (e.g. Erhardt 1985, Lawton *et al.* 1997, Didham *et al.* 1998, Debinski *et al.* 2000, Summerville and Crist 2001, Kruess and Tschardtke 2002). Butterfly fauna is usually

associated with its corresponding vegetation types. Although many butterfly larvae feed on a variety of plants, a small number of butterfly larvae feed on only a single plant. Forest disturbance obviously causes changes in vegetation types that consequently affect butterfly fauna.

Although a number of studies on the effect of habitat disturbance to butterfly communities have been conducted in different parts of the world, the research on the effect of habitat disturbance caused by human beings to butterflies in tropical rainforests is limited. Studies identifying and developing ecological indicators to assess changes of tropical forests or other tropical forest ecosystems are scarce. Presently there is no butterfly monitoring being carried out in Vietnam. Yet the response of butterfly communities to habitat changes is probably one of the most conspicuous, and in addition to the fact that they are easily observed and better known than other groups of insects, this makes them a perfect study animal for this much needed research project.

The first priority of the project is to study a local protected area and detect the actual temporal changes in butterfly populations, with the aim of using the results to inform butterfly conservation management practices. Through the four-year Earthwatch project, using butterflies as eco-indicators of habitat disturbance in Tam Dao National Park, we have identified some butterflies that can be used as eco-indicators of forest health. At first glance, our results indicate that destroyed vegetation negatively impacted butterfly abundance; fewer butterflies were recorded in later years. This project aims to continue identifying butterflies as eco-indicators to assess changes in habitat and environment and monitor butterfly species populations, especially those species in Tam Dao National Park which serve as eco-indicators. Monitoring local butterflies over the long-term can reveal the stabilization, decline or expansion of butterfly species populations due to loss or disturbance of forest ecosystems. This is helpful and useful for the conservation of butterflies as well as forests and other forest ecosystems.

The contribution of Earthwatch volunteers to this research is necessary and appreciated. During the project, Vietnamese staff and volunteers will work and live together, and research teams will have shared meals, creating an opportunity to talk about different cultures, traditions and customs. While Earthwatch teams are in field, English will be used to communicate, though volunteers with a knowledge of Vietnamese will find it helpful when speaking with local people and others. Volunteers are welcome to visit the friendly local people who are very hospitable and enjoy meeting visitors from other countries. Additionally, there may be chances to enjoy bird-watching and other nature activities during free time. After the expedition, volunteers may wish to experience a variety of other sites in the surrounding area. You can take part in expeditions to local peaks, including the highest peak of Tam Dao, or visit local and national festivals in spring and autumn, go to Ha Long Bay for a two-day trip, or visit ancient ruins or other popular tourist attractions.

2. RESEARCH AREA

Tam Dao was declared a forest-protected area with 19,000 ha in 1977, and in 1996 this area was designated a National Park and was extended to include 36,883 ha of natural forest and 15,515 ha of buffer zone. It is located in four districts of three provinces: Tam Dao and Lap Thach districts of Vinh Phuc province, Son Duong district of Tuyen Quang province, and Dai Tu district of Thai Nguyen province.

Studies of the park's biodiversity have been carried out since the 1930s. In recent years, several projects by both the Vietnamese and foreigners concentrated mainly on vertebrates and vascular

plants. According to the data presented in a conference on biodiversity of the park in December 2000, there are 64 species of mammals, 243 species of birds, 76 species of reptiles, 33 species of amphibians, and 52 species of fishes.

Limited insect research has been conducted in the park since 1980 by Vietnamese and foreign scientists. The resulting list consists of 122 species of Chrysomelidae (Coleoptera), 328 species of leaf hoppers (Hemiptera), and more than 350 species of moths. However, this list represents a very small portion of the park's insect fauna. Ecological studies concerning aspects of butterfly community composition in the closed forest and in gaps at high elevation have been carried out in Tam Dao since 1986 by Czech entomologists. The resulting list of butterflies contains 112 species of big butterflies (Papilionoidea except Lycaenidae). In addition, more than 60 butterfly species on mountain tops of the park were recorded in a 2001 survey (Vu and Dang, 2001), as well as 203 butterfly species of Papilionoidea (except Lycaenidae).

Despite Tam Dao's park designation, much of the research area lies within disturbed forest. The sites where our studies will be conducted are situated in higher parts of Tam Dao as well as in lowland areas. Lower slopes are deforested, overgrown with grass and subject to erosion. In some areas at low elevations, pines and other trees were planted by humans at different times in the past. According to recent studies, there are 1,200 species of vascular plants identified. The families with numerous species are Euphorbiaceae, Moraceae, Lauraceae, and Fagaceae. Vegetation cover is classified and divided into five forest types: tropical evergreen closed rainforest, lowland subtropical closed rainforest, short vegetation on mountain ridges and tops, mixed bamboo forest, and regenerating forest.

Tropical evergreen closed rainforest is generally located below an altitude of 800 m and covers most of Tam Dao National Park. Its vegetation structure is complex, including many strata with heights up to 25 m, and the canopy is dense with broad-leaved evergreen trees. Due to rapid human population growth and the increasingly high demand for firewood, the forest is being heavily disturbed, with high value trees being exploited most heavily.

Lowland subtropical closed rainforest is distributed at altitudes of 800 m and above at the cloud band, where humidity favors mosses and lichens. In this forest, species of Dipterocarpaceae are absent. The dominant trees are species of Lauraceae, Fagaceae, Theaceae, Magnoliaceae, and Hamamelidaceae.

The short vegetation on mountain ridges and tops is often covered by fog, and is comprised of small and short plants (average height of 1.5-2 m) and trees covered nearly fully by mosses and lichens.

In mixed bamboo forest, exploitation, logging and other disturbance activities have caused the vegetation to change markedly into mixed evergreen woodland and bamboo groves. Bamboo occurs naturally in the forests, but it is often exploited for use in construction, while young shoots are taken for food. The growth of bamboo is encouraged by cutting the surrounding trees which allows the bamboo to become the dominant tree.

There are 23 communities of regenerating forest in the buffer zone located in three surrounding provinces. The forest here was heavily disturbed before the 1980s. At that time, wood exploitation firms located near the park practiced heavy commercial logging. In addition people in the region burned forests for agricultural purposes. Only after the park was founded did wood exploitation and burning become prohibited by law, however illegal exploitation still occurs. Since the park's existence, there has been little felling and the forest has been allowed to regenerate; however, in 2005 building of a new road to the forest has destroyed a large forest area. The vegetation composition is typical for secondary forests recovered after multiple heavy disturbances.

3. PROJECT STAFF

Note: In Vietnam, family names are written first and given names last. For example, the Principal Investigator's family ("last") name is Vu and his given ("first") name is Lien.

Principal Investigator

Vu Van Lien is currently conducting Ph.D. work on butterflies of Tam Dao. He holds a Master's degree in Conservation Biology from the Institute of Kunming Zoology, Chinese Academy of Sciences, having graduated from the Hanoi Agricultural University with a specialty in plant protection. He has served as Principal Investigator on the *Butterflies of Vietnam* Earthwatch project since 2002 and is a researcher with the Vietnam Russia Tropical Center in Hanoi. Prior to holding this position, he was a research assistant at the center and participated in surveying and research on biodiversity of tropical forest in protected areas of North and Central Vietnam, specifically in regards to butterflies. He also has experience as a staff member of the Center of Agricultural Extension, Institute of Post-harvest Technology. His hobbies include traveling and photography and he is able to speak English and some Chinese. He will be in the field during all Earthwatch teams and will lead volunteers in the fieldwork.

Team Leader

Dang Ngoc Anh graduated from the Agro-Forestry Institute, Hanoi, having specialized in forest management. He has been surveying insects and butterflies in protected areas of Vietnam since 1997 and has been an Earthwatch Team Leader with the *Butterflies of Vietnam* project since 2002. His experience includes serving as Senior Researcher with the Institute of Forest Inventory and Planning, Ministry of Agricultural and Rural Development. His hobbies include meeting new people and watching butterflies and other beautiful insects and he speaks Chinese and some English. He will be in the field during all Earthwatch teams and will lead volunteers in the fieldwork.

Logistics Coordinator

Vu Dinh Viet has a bachelor's degree in English (as a foreign language) from Thai Binh Language College and since 2002 has been responsible for coordinating the logistics of the *Butterflies of Vietnam* project. He also teaches English as a second language at a primary school in Tien Hai, Thai Binh Province. His hobbies include meeting foreign people, especially people from English-speaking countries, learning about environmental issues and improving his English in order to better teach students about English and the environment. He will assist volunteers while they are in the project site.

Additional Staff

Do Dinh Dung, a staff member of the Tam Dao National Park, and other scientists and students from the park as well as from other institutes and universities will contribute to the project.

DAILY LIFE IN THE FIELD

4. TEAM ITINERARY

- Day 1:** Volunteers will be met in Hanoi and brought to the hotel at Tam Dao tourist village (research site) in order to relax after the long trip. At Tam Dao you will meet the project staff and get prepared for fieldwork.
- Day 2:** Volunteers will be introduced to transect methodology and receive instruction on transects and field surveys.
- Days 3-7:** Fieldwork. Volunteers will have free time in the evening and sometimes in the afternoon. During this time you can use the internet, go to the pub, swim, use a sauna, get a massage (available in the area), relax in your room, etc.
- Day 8:** If all is going well, volunteers will have a day off to visit temples and local families, hike the local mountain peak, or visit other sites. You may have lunch outside the project area at your own expense.
- Day 9:** Volunteers will leave Tam Dao at 8:00 am to visit the biggest open market in the capital of Vinh Phuc province for an hour and then go to the airport (for people who depart that afternoon). Volunteers who decide to remain in Vietnam after the end of the project may continue sightseeing in Hanoi with the Principal Investigator (PI) in the afternoon, with possible sites including the Museum of Ethnology. In the evening, volunteers may go to see an hour-long water puppet show.

Volunteers should consult a travel guidebook for information on local attractions. See Section 15 '*Helpful Resources*' for suggested guidebooks.

5. DAILY SCHEDULE AND TASKS

Volunteers should be aware that schedules can and do fluctuate. For example, some transects are longer and cover more difficult terrain and therefore take more time to complete. On work days, volunteers will be in the field for 6-7 hours. Weather and work conditions can also affect the daily schedule. Should this situation arise, your cooperation and understanding are appreciated.

- 7:00-7:30 am:** Breakfast
8:30-11:30 am: Start fieldwork
11:30 am-1:00 pm: Break for lunch
1:00-5:00 pm: Continue fieldwork*
6:00-6:30 pm: Dinner
6:30 pm: Free time

*If a laptop is available one volunteer will usually spend the afternoon entering data. This duty will be rotated throughout the team.

6. VOLUNTEER FIELD TRAINING AND ASSIGNMENTS

Training

The PI will give the team a more detailed onsite project briefing when you arrive. We will train volunteers in the methodology of the project: how to set up transects and how to identify butterflies (distinguish butterflies from moths, identify butterfly families and common species) in the field by sight, color plates, or preserved specimens. Volunteers will be provided with a color printed guidebook of butterflies. Your skills in butterfly identification will increase as the survey progresses. We will also train volunteers on how to use hand nets to catch the butterflies and how to hold them, how to observe and then record butterfly and other information on datasheets, and how to enter data into a laptop. Instructions will be given on how to monitor butterflies at fixed sites and how to use butterflies as ecological indicators to monitor and assess changes of habitats and environment overtime.

Informal lectures about the project (such as methods of butterfly identification and transects) will be given at the hotel in the morning and the team will practice in the field in the afternoon. In addition, we will train volunteers in the field while working on transects as well as other suitable times. You will also be introduced to the culture, customs and daily life of Vietnamese people.

Assignments

Butterfly transects will have already been set up in the field by previous Earthwatch volunteers. Each team of volunteers will be employed to walk along the transects and to count and record all butterflies once or twice daily. In order to identify butterflies correctly and record the information on a datasheet, participants will need to learn to identify butterflies by sight, as well as by catching them. Butterflies that can be recognized by sight will not have to be captured, however those that are difficult to identify will need to be caught so pictures can be taken by digital camera for later identification. Volunteers may help take pictures of larvae, food plants and butterflies along transects. In addition, you may be asked to help collect some butterfly specimens outside transects at different sites to help make a comprehensive list that might reveal endangered and threatened species.

Each team of volunteers will be divided into two small groups, and each will work transects at two sites. There are five butterfly transects located in varying habitat types, including grass, heavily disturbed forest, closed forest, a road within the forest and the forest edge. The road transect will be walked twice daily, meanwhile forest transects may be walked once or twice daily, except on rainy days. The forest transects can be rather challenging especially on wet and humid days, so volunteers who have difficulty are recommended to walk the road transect.

In each group one volunteer will record information on a datasheet and others will observe, count and catch butterflies as necessary, taking pictures and then releasing them. Each group will include one Vietnamese entomologist (the PI or Team Leader) who will help volunteers correctly identify butterflies. In the afternoon one volunteer may be assigned to help enter data from the datasheets into the laptop. Tasks will be rotated so that each volunteer can participate in a variety of work.

7. ACCOMMODATIONS

The team will stay at a simple but comfortable Hotel in Tam Dao tourist village, about 0.5-1 km/10-15 minutes from the field site. Rooms have two single beds or a double bed with sheets, pillows, towels, flush toilets, hot and cold water, refrigerator and television. There will be two volunteers per room. There is a reliable supply of electricity with a voltage of 220 volts AC so you may bring electronic equipment such as digital cameras. There are two and three prong plugs, depending on age of construction, and you may want to bring an adapter.

Laundry service is available for a modest price but clothes take a while to dry due to high humidity. Women pound the dirt out of your clothes with their feet by standing in an old claw foot tub at the back of the hotel. Clothes come back clean but may get stretched out.

There is an internet café near the site open from morning to midnight each day, about 300 m from the hotel, but it connects through a telephone line so it is very slow and not reliable. Four or five people can use the internet at the same time. The cost of use is about US\$0.7 per hour. Note that in May, October and November the internet café may not be open due to the lack of tourists in the area.

8. FOOD

Volunteers are not required to do any cooking, but may prepare meals or other food to eat if desired. The team will eat meals together at the hotel or at local restaurants. Meals are prepared in traditional northern Vietnamese style (6-8 dishes eaten with chopsticks). The list below is intended to provide a general idea of food types, but it is important that volunteers be flexible.

Breakfast:	Bread with cheese, butter or egg, instant noodles, rice noodles with pork, chicken, eggs, beef
Lunch/Dinner:	Steamed rice, various vegetables, spring rolls, soup, meat (chicken, beef, pork) fresh fish, eggs, tofu, peanuts
Beverages:	Coffee, various teas (Lipton, Dilmah, Vietnamese green tea, etc.), milk, soda, fruit juice, beer (Tiger, Carberg, Halida, Heineken, Hanoi, etc.), wine, variety of alcohol (note that alcohol may be purchased by volunteers but will not be provided with meals)
Other:	Cake, fruit (apples, pineapples, watermelon, mangos, oranges, bananas)

There also are other kinds of food available in the tourist village, including some western foods. We can accommodate vegetarians provided they let us know in advance. Vegetarian meals will be fairly limited in variety.

Special Dietary Requirements

Please alert Earthwatch to any special dietary requirements as soon as possible (e.g. diabetic, lactose intolerant, etc.). Accommodating special diets is not guaranteed and can be very difficult due to availability, location and local conditions.

Special note to vegans and strict vegetarians: Please be aware that it is often difficult to accommodate strict vegetarians and vegans. It may be possible to get meatless meals but vegans and strict vegetarians may have a problem avoiding animal products altogether. If this poses a problem, then participation on this Earthwatch expedition should be seriously reconsidered.

TRAVEL PLANNING

9. BEFORE YOU LEAVE

Note: All visitors are required to submit a Medical Arrival/Departure Card provided by the Health Quarantine Service to screen against travelers who may be infected with the Severe Acute Respiratory Syndrome (SARS) virus. Visitors with high fevers or other specified symptoms are asked to declare themselves and may be required to submit to medical checks before being allowed to enter the country.

For a listing of useful websites for passport and visa requirements see Section 15 *'Helpful Resources.'*

Passport Information

Most volunteers traveling from outside the host country will require a passport valid for at least six months beyond the dates of travel.

Visa Information

All visitors will need a tourist visa for entry to Vietnam unless your home country has a reciprocal agreement with the Vietnamese government making visa-free travel possible. Tourist visas, which allow volunteers to stay in Vietnam for 30 days, may be obtained from the nearest Vietnamese embassy or consulate.

Volunteers will need to bring their passports and visas to research site. Vietnamese staff will help you declare the duration of your stay to local police in the area (this is standard procedure in Vietnam). Please make sure to keep the duplicate copy of your customs form on hand. This form may be requested at hotels and will be necessary to show again at the airport upon departure.

Citizens of other countries should check with their travel agent or a visa agency for specific visa and entry requirements.

Reminder: The purpose of your visit is for vacation, holiday, or travel. Foreign immigration officials do not always understand the concept of a "working vacation" or even "volunteering." Words such as "working"/"volunteering," "research" or a "scientific expedition" can raise questions concerning the country's foreign labor laws and/or prompt questions about official scientific research permits and credentials, etc., to which volunteers on their own will not be equipped to respond. All required research permits for the project are in place and have been approved by the proper authorities.

Essential Information for Volunteers Requiring Visas

Type of Visa	You must get a TOURIST VISA .
Where to Get a Visa	Contact the nearest embassy or consulate of the country to which you are traveling to find out how to apply for your visa. Please note that this process can take weeks or more. If you have less than six weeks or wish to save yourself trouble, we strongly recommend using a visa agency , which can both expedite and simplify the process. See below for a list of visa agencies.
Required Information	You will need to send your passport (valid for at least six months beyond your stay), a Visa Application and Immigration Form, 2-4 passport-size photos plus payment to the embassy or visa agency (if applicable). Please be sure that your passport is valid for at least six months beyond your stay.
Cost of a Visa	Generally between US\$40-100, but varies from country to country and can potentially cost up to US\$180 . A visa agency will charge an additional fee (depending on the amount of time it takes to process the application), which you can inquire about directly.

Visa Agencies

IN THE UNITED STATES	IN EUROPE	IN AUSTRALIA
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	The Visaservice Tel: +44 (0) 8708 900 185 Fax: +44 (0) 20 7278 8464 Website: http://www.visaservice.co.uk Thames Consular Services Ltd Tel: +44 (0)20 8995 2492 Fax: +44 (0)20 8742 1285 Website: http://www.visapassport.com	Ask your travel agency if they can send your visa application on your behalf.

Volunteers Under 18 Years of Age

Entry to Foreign Countries

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 volunteer under 18 can be refused entry into the country. There is nothing Earthwatch Institute can do to help in this circumstance.

Cancellation Insurance

We highly recommend trip cancellation insurance, which will help cover your airfare if you are unable to travel. Earthwatch does not reimburse airfare or costs associated with cancelled flights. Check with your travel agent to find out how to obtain trip cancellation insurance.

Earthwatch Europe volunteers can purchase Additional Cancellation Cover for £10 as a supplement to the main premium that covers non-refundable travel expenses should your team be cancelled.

International Evacuation Insurance

The travel medical and evacuation insurance, coordinated by CEGA Group, is mandatory for Earthwatch volunteers while on an Earthwatch expedition anywhere in the world. The insurance covers volunteer 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 volunteer'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 volunteers who would like to extend the period of coverage, increase insurance amounts or purchase additional cancellation or baggage insurance.

A detailed description of the Volunteer Medical and Evacuation Insurance Program policy will be sent with this briefing. **Please note that policies are specific to each Earthwatch office.**

Travel Agencies

Contact your local travel agent or use the web to find the lowest rates to make your travel arrangements. A list of suggested travel agents can be found in Section 15 'Helpful Resources.' Be sure to give your rendezvous details to your travel agent as soon as possible so they can plan your trip accordingly.

Other Advice / Information

- *Local currency:* Vietnamese dong
- *Language:* Vietnamese. There are also several other languages spoken by various ethnic minorities, particularly in the central highlands and in the far north. Much of the older generation still speaks French (the language of the colonial power), and there are some who

speak Russian. However, young people are more likely to be able to speak English, and English will be used to communicate during the project.

- *International dialing code:* +84 (country code)
- *Electricity:* 220V, 50 Hz, both two and three prong plugs
- *Time zone:* GMT/UTC +7
- *Personal funds:* Volunteers should have some money in Vietnamese dong (equivalent of US\$50-100 recommended) for personal expenses such as snacks, shopping, telephone, laundry, etc. There are no additional costs for visiting museums or for the water puppet show. Currency should be exchanged into Vietnamese dong at the airport upon arrival. Major banks in Hanoi will cash traveler's checks. Money can also be exchanged in Hanoi and Vinh Phuc town (about 15 km from Tam Dao headquarters).
- *Personal belongings:* While staying at the hotel in Tam Dao, volunteers should keep valuables in the safe at the hotel reception. Items should be packed and signed before they are given to the hotel receptionist.
- *Tipping:* Tipping is not customary, but any tip you wish to give will be appreciated.
- *Traffic:* The traffic in Vietnam can be hectic with many motorcycles making it difficult for new visitors to cross the road. It is suggested that when crossing the road you walk slowly so that motorcycles will go around you.

10. 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 11 'Health Information' for inoculation information.

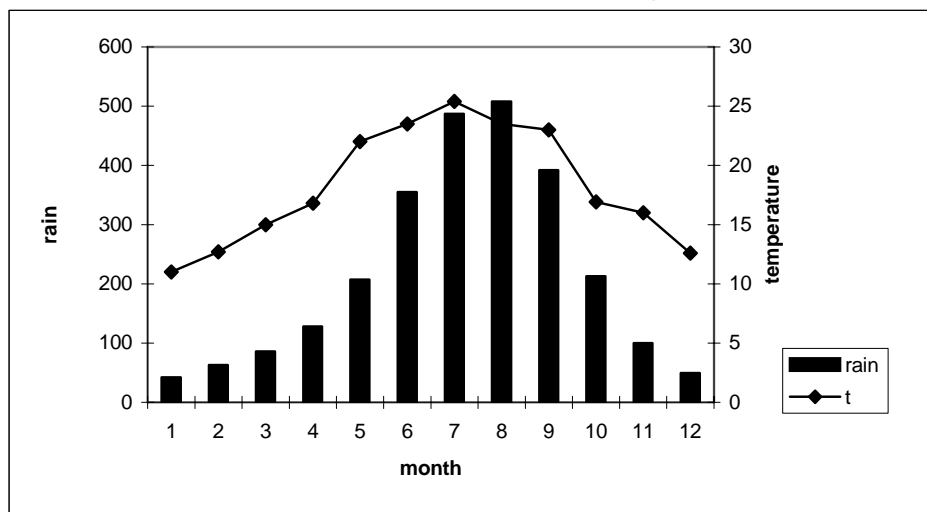
To the examining physician:

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 Research Area

The area is rather flat but the terrain is uneven, rocky and rough and can be slippery after rain. Altitude at the research sites ranges from 900-1,350 m above sea level. The weather is tropical and varies throughout the year. It is divided into two seasons: the rainy season (April-October) and dry season (November-March). The temperatures are hot, particularly during June through September, and may reach 38°C/100°F. The humidity is also very high, ranging from 65-95%.

Rainfall in Millimeters and Mean Temperature in Degrees Celsius



Physical Demands

Volunteers should prepare for the physical demands of the project. You might want to work out on stairs or hike to nearby mountain tops before joining the expedition. You should be in good physical condition and should have done regular exercise such as running, hiking, and other forms of physical activity.

During the training day, volunteers must hike the transects on easy trails for approximately 2-3 hours over a distance of 3-4 km. Each day will involve hiking 1-2 km from the hotel to the field site and back on a road. Fieldwork will include walking 5-6 km on transects (sometimes on relatively easy transects, sometimes on difficult transects) for 5-6 hours on five days. Note that you must carry 3-5 kg (water and other personal items) during hikes. Volunteers should wear sturdy footwear with ankle support and long trousers tucked into socks, and should walk at a slow pace while hiking the transects.

The specific areas where volunteers will be hiking/walking are described below.

- *Tower*: There are around 1,200 steps from Tam Dao to the tower. The steps are often uneven and covered in moss so they can be slippery.
- *New road transects*: The transects cover 2 km of new road currently being constructed. The road can be muddy and there are small rocks in many places.
- *Mountain (bamboo forest)*: This transect is for volunteers with good physical fitness only. The terrain is difficult in this area, and volunteers will climb from 950 m up to 1,350 m through forest and over slippery stones. The ground is mostly wet due to plant cover blocking the sun, resulting in the presence of many leeches.
- *New forest transect*: This transect is 700 m along a section of a path in the forest. The path is narrow, usually uneven and slippery after rain or on wet days.

Potential Hazards

Hazard	Associated Risks and Precautions
Transportation	Road and driving conditions in Vietnam are considered poor. Traffic, particularly in urban areas, can be chaotic with little attention paid to usual “rules of the road.” Road hazards include wet and rainy conditions (landslides in the extreme cases), road use by many types of vehicles (bicycles, motorcycles, cars, buses, cyclos, etc.), pedestrians, livestock and wildlife, poor lighting, fast and reckless drivers, and lack of working seatbelts in many vehicles.
Walking/ Hiking	Parts of the trails are very narrow and rocky, and on a steep hill. Humidity makes the trail very slippery. Trails may be bordered by steep ravines and/or thick vegetation. Teams may also come across animal traps on the trails. Excellent footing and balance are necessary. During the road transect, take care to walk at the side of the road to avoid cars and motorbikes.
Climate	Because of the heat and humidity, heat stroke and dehydration are risks. You must go at a slower pace than usual and drink water regularly throughout the day, even if you do not feel thirsty, to avoid dehydration. Wear sunscreen, a wide-brimmed hat and sunglasses. Long sleeves and trousers can also help to protect your skin.
Animals	There are leeches and mosquitoes in the forest in the rainy season, especially after the rain, so use mosquito repellent and wear long sleeves and trousers, tucking them into long socks (we recommend that you wear two pairs of socks), and closed shoes or boots. Leeches are an annoyance but they do not transmit any diseases. Additionally, bees and venomous snakes are present, and some hairy caterpillars may cause a rash on your skin, so please do not touch any of them.
Plants	Some plants have sharp thorns, including some types of bamboo. Take care when touching plants to avoid getting scratched by thorns.
Social/Cultural	Due to Vietnamese custom, people shouldn’t wear short pants and t-shirts when visiting temples and pagodas.
Personal security	Valuable and important items such as passport, money, jewelry and airplane tickets should be kept in the safety box in the hotel.

Medical Conditions of Special Concern

People with heart, kidney, back or knee problems must consider, with advice from their physicians, whether they can fully participate on this project. The conditions in which we will be working, including extreme heat and humidity and steep and slippery terrain, would make the project difficult for those with limited mobility or physical fitness. Volunteers should do exercises such as hiking, running and bicycling to prepare for the project and make participation easier. Consult with your physician about any condition that might make participation difficult or uncomfortable.

11. HEALTH INFORMATION

Routine Immunizations

All volunteers should make sure they have the following up-to-date immunizations required by your home country: 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.

Project Inoculations

The following are recommendations only. Medical decisions are the responsibility of each volunteer. 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 (www.who.int) or the resources in Section 15 'Helpful Resources' for the latest health information for travelers.

	Required for Entry	Recommended for Health Reasons
Typhoid		X
Yellow fever	X - If traveling from countries or region where it is endemic, a Certificate of Vaccination is required.	
Hepatitis A		X
Cholera		*
Japanese encephalitis		**

* Cholera may be present in the research area. In 1973 the World Health Organization (WHO), recognizing that immunization cannot stop the spread of cholera among countries, deleted from the International Health Regulations the requirement of cholera immunization as a condition of admission to any country. In 1990 the WHO stated that immunization against cholera was not effective and they do not recommend it. In 1991 the WHO confirmed that certification was no longer required by any country or territory.

** The Center for Disease Control (CDC) recommends the Japanese encephalitis vaccination for most people only if staying in a rural area for more than four weeks or if there has been a recent outbreak of the disease in the area in which you will be traveling.

In 2003, there was an outbreak of a relatively new virus that became known as Severe Acute Respiratory Syndrome (SARS). SARS is a respiratory disease caused by a coronavirus that can be spread from person to person through close contact. It has been well contained since the original

outbreak, which spread from China throughout Southeast Asia, including Vietnam, and to North America and other areas as well. Only a few cases have been reported in 2004 to date, none in Vietnam. There are no travel advisories regarding SARS at this time. Volunteers should be aware that some countries may conduct SARS screening at their airports, checking for SARS symptoms such as coughing and high fever.

There have also been cases of avian influenza reported in Vietnam in 2004 and 2005. Avian influenza (also known as bird flu) is a widespread infectious disease previously found in birds and pigs. It has recently spread to humans via direct contact with bird fecal matter. There have been no cases to date in which the disease has been proven to be transmitted from human to human, making the risk of contracting avian flu extremely low for tourists and travelers. It is safe to eat cooked chicken and eggs. To contain the disease and prevent further outbreaks, many chickens have been culled in affected countries, including Vietnam. Travelers are cautioned to avoid poultry farms, contact with animal fecal matter, and animals at live food markets.

Other diseases in Vietnam include dengue fever, plague, schistosomiasis, HIV/AIDS, and malaria. While not present at the research site, malaria is present in other rural areas of Vietnam and may be chloroquine resistant. If you intend to travel to other areas of Vietnam you should discuss prophylaxis with a doctor.

Additionally, the WHO estimates that one-third of the world's population is infected with the bacterium (*M.tuberculosis*) that causes tuberculosis (TB). Incidence of tuberculosis is higher in developing countries, particularly in Asia, Africa, the Caribbean and Latin America. In general, approximately 10% of persons infected with *M. tuberculosis* are at risk for developing active TB during their lifetimes. TB is considered highly treatable with medications that are of relatively low toxicity and cost. Volunteers returning from developing countries are encouraged to have a (PPD)-tuberculin skin-test to screen for potential infection.

These recommendations are for this project site only. Please consult your physician for guidance on inoculations if you intend to travel to other parts of the country. Inoculation requirements and suggestions are subject to change. Be sure to consult a public health organization prior to travel to ensure that you have the most current inoculation information.

12. PACKING CONSIDERATIONS

PLEASE BRING YOUR EXPEDITION PACKING CHECKLIST WITH YOU ON YOUR EXPEDITION! IT IS LOCATED AT THE BACK OF THIS 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. When visiting temples and pagodas, it is proper to wear a long skirt or trousers, not shorts or t-shirts.

Weather Considerations

Please take into consideration the weather conditions during your team when packing for your expedition. Climate information can be found in Section 10 '*Project Conditions.*' The temperature sometimes reaches 38°C/100°F in open areas, so bring sun protection such as sunscreen, hat and long-sleeved shirts. Because teams occur in the rainy season (April-October), plan to get wet.

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.

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!

13. RECOMMENDED READING

Scientific Media

Books

- New, T.R. 1997. *Butterfly conservation*. Oxford University Press.

Journals

- *American Butterflies*: <http://www.naba.org>
- *Butterfly Conservation News*: <http://www.butterfly-conservation.org>

Articles

- Pollard, E., Elias, D.O., Skelton, M.J. and Thomas, J.A. 1975. A method of assessing the abundance of butterflies in monks wood national nature reserve in 1973. *Entomologist's Gazette*, 26, 79-88.
- Sparrow, R.H., Sisk, D.T., Ehrlich, P.R. and Murphy, D.D. 1994. Techniques and guidelines for monitoring Neotropical butterflies. *Conservation Biology*, 8, 800-809.
- Spitzer, K., Jaros, J., Havelka, J. and Laps, J. 1997. Effect of small-scale disturbance on butterfly communities of an Indochina montane rainforest. *Biological Conservation*, 80, 9-15.
- Vu, V.L. and Yuan, D.C. 2003. The differences of butterfly (Lepidoptera, Papilionoidea) communities in habitats with various degrees of disturbance and altitudes in tropical forests of Vietnam. *Biodiversity and Conservation*, 12, 1099-1111.

Popular Media

Books

- David, C. 1996. *Butterflies and moths*. Dorling Kindersley Books: <http://www.dk.com>
- Schappert, P. 2000. *A world for butterflies*. Firefly Books.

Field Guides

- Butterfly pictures of Tam Dao grouped by different families:
<http://www.pbase.com/vulien/butterflies>
- Lekagul, B., Askin, K., Nabhitabhata, J. and Samruadkit, A. 1977. *Field guide to the butterflies of Thailand*. Association for the conservation of Wildlife, Bangkok.

14. EMERGENCIES IN THE FIELD

Taxis are available at the research site for emergencies. The following steps will be taken in the unlikely event of a medical emergency.

In case of minor injuries, doctors or nurses nearby will treat volunteers. There is a local clinic at the research site. If anyone is injured in the forest, project staff and other volunteers will help him/her. He/she will be transferred to local clinic and treated there.

In case of major/life-threatening injuries, the volunteer will be treated with first-aid and then he/she will be transferred to the local clinic for further treatment or to the nearest fully-equipped hospital as soon as possible by taxi or car available at the research site.

If a volunteer's leg is broken, the broken leg will be fixed to wood or bamboo bars collected in the forest and then he/she will be transferred to the local clinic or nearest hospital.

If a volunteer is bitten by a venomous snake, firstly he/she will be treated using a snake-bite emergency box that is brought with us. The injured then can be transferred to the central hospital in the capital of the province or Hanoi or will be transferred abroad for treatment if necessary.

Proximity to Medical Care

Nearest clinic	Tam Dao tourist village Tel: 0211-843139
Nearest full-facility hospital	Vinh Phuc General Hospital Vinh Phuc town Tel: 0211-824215 25 km/30-40 minutes from the research site

15. HELPFUL RESOURCES

Project Website

- <http://www.pbase.com/vulien>

Useful Visa Information

- General: <http://www.embassyworld.com>
- For Japanese citizens: http://www.rainbowt.jp/travel/visa_top.html
- For Australian citizens: <http://www.travel.com.au>
- Passport Visa Express: <http://www.passportvisaexpress.com>
- The Visaservice (for US citizens): <http://www.visaservice.co.uk>
- Thames Consular Services Ltd: <http://www.visapassport.com>

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>

Travel and Airline Resources

- Some Vietnamese websites for hotels in Hanoi: <http://www.camelia-hotels.com>, <http://www.desyloia.com>, <http://www.asia-hotels.com/lucky>
- Travel information, travel agents, hotel information through out Vietnam: <http://www.vietnamtourist.com>
- TravelNotes.org: <http://www.1800-fly.com>
- World Travel Guide: <http://www.worldtravelguide.com>
- Cheap Flights (worldwide): <http://www.travelix.com/> or <http://www.discountair.com/>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>
- Third World Traveler – offers many links for useful travel information: http://www.thirdworldtraveler.com/Travel/Travel_Links.html
- STA Travel (US): <http://www.statravel.com>
Tel: +1 800 781-4040
- STA Travel (UK): <http://www.statravel.co.uk>
Tel: +44 (0) 1865 792800
Fax: +44 (0) 1865 792911
Email: manager.oxford@statravel.co.uk
Quote code: EWE01/02
- Wexas International (Europe): <http://www.wexas.com>
Tel: +44 (0) 20 7581 8761
Fax: +44 (0) 20 7581 7679
Email: southern@wexas.com
Quote code: EWE01/02
- UK Foreign Office travel advice: <http://www.fco.gov.uk/travel>
- Travel website for Australia: <http://www.smartraveler.gov.au>
- Uniglobe Travel:
<http://www.onetravel.com/Air/AirSearch.aspx?module=Eair&DK=1000010265>
- Frosch International Travel: <http://www.froschtravel.com>
Tel: +1 713 850-1566
+1 800 866-1623 (toll free)
Fax: +1 713 850-0027

Country Information

- Country Reports - country information from around the world: <http://www.countryreports.org>
- National Geographic Map Machine: <http://plasma.nationalgeographic.com/mapmachine>
- U.S. State Department: <http://www.state.gov/>
- World Time Server: <http://www.worldtimeserver.com/> (time worldwide with GMT/UTC) or <http://worldbuddy.com>
- Currency Converter: <http://www.xe.com/ucc/>
- Telephone dialing from and to anywhere: <http://kropla.com/dialcode.htm>
- Online Unit Conversions: <http://www.onlineconversion.com>
- Worldwide Weather: <http://www.worldweather.com> or <http://www.wunderground.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.spri.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/>
- Hospital for Tropical Diseases Healthline (UK)
Tel: 0906 1 337733 (within UK)
(calls are charged at 50p per minute)
- MASTA Travelers' Healthline (UK)
Tel: 0906 8 224100 (within UK)

THE RESEARCH

16. BACKGROUND, OBJECTIVES AND METHODS

Background

Identifying and developing eco-indicators is a considerably recent practice among ecologists and biologists interested in the conservation of biodiversity. Attention has focused on the use of terrestrial invertebrates as bio-indicators because of their dominant biomass and diversity and their fundamental importance in ecosystem function (Disney 1986, Rosenberg *et al.* 1986, Majer 1989). Bio-indicators have been used to assess ecosystem responses to environmental disturbance that are often associated with human land use (Noss 1990, Mc Kenzie *et al.* 1995). To assess environmental or habitat disturbance an integrated group of indicators should be developed and each indicator group should meet certain criteria. There is no single group of animals that can be used as indicators of changes in the diversity of other taxa (Lawton *et al.* 1997).

Butterflies are widely recognized as potentially valuable ecological indicators (e.g. Gilbert 1984, Erhardt 1985, Brown 1991, Sutton and Collins 1991, Kremen 1992, Debinski and Brussard 1992, Sparrow *et al.* 1994, Kerr *et al.* 2000, Vu 2004 in press). They fulfill many criteria known to define useful biological indicator groups: short generation times, day-flying, recognizable, widespread, and relatively diverse. Butterflies are sensitive indicators that react quickly to environmental changes, and they are abundant enough to meaningfully analyze. The richness of available historical data on butterflies makes them an ideal group for studies on changes in the status of the different species (van Swaay 1990).

Studies of butterflies have been conducted in many parts of the world, especially in England, where a butterfly monitoring scheme was set up in 1976 (e.g. Pollard 1979, 1982, 1990, 1992, Warren *et al.* 1984, Pollard and Lakhani 1985, Pollard and Hall 1989, Yates and Harding 1991, Banwell and Crawford 1992, Yates 1992, Pollard and Eversham 1995, Pollard and Yates 1993, Pollard and Greatorex-Davies 1996). This monitoring detected declines in many butterfly species, with some becoming locally extinct due to impacts of weather, habitat disturbance and other negative human activities.

Butterflies of Indochina (Vietnam, Laos and Cambodia) were first studied in 1919 (Vitalis de Salsava 1919), and major butterfly fauna surveys were carried out in Vietnam in the mid-20th century (Metaye 1957). The butterflies in Tam Dao National Park have been studied since 1986 (Leps *et al.* 1990, Spitzer *et al.* 1993, 1997, Monastyrskii *et al.* 1995, Vu and Dang 2001, Vu 2001, Vu and Yuan 2003), however, these butterflies are still relatively unknown and further research is necessary, especially in regards to their ecology and biology.

Long-term monitoring focused on the local population dynamics of butterfly species in Vietnam, compared from year to year, is an important method to reveal habitat changes and environmental degradation due to human activities or climate change. A long-term butterfly monitoring scheme has the potential to provide timely information on changes in the biota and, when properly designed, to identify appropriate responses to reverse undesired trends.

Thus far, the long-term monitoring conducted by this project has revealed the following:

- There are differences of butterfly abundance and diversity among different habitat types with different disturbed levels.
- Destruction of vegetation affects butterfly abundance. In 2002, butterflies were very abundant, especially along the local road where vegetation was healthy. In 2003, however, vegetation along transects was destroyed, and that impacted butterfly abundance in 2003 and the following year.
- Some butterflies are only found in a specific habitat such as under forest canopy, forested area, disturbed forest, short grass, and tall grass. Some butterfly species can be used as eco-indicators of specific habitats and are valuable for long-term monitoring for ecology and conservation.
- Weather conditions such as temperature, cloud cover, and wind at different times of the day (e.g. morning and afternoon) significantly affect butterfly flying activities.
- There is butterfly fluctuation in different months of the year.
- There are some butterfly larvae food plants that could be valuable in the development of butterfly farms in the area.

Objectives

In the next phase of this project we aim to:

- Continue to identify butterflies that can be used as ecological indicators of habitat change in Vietnam, as changes in butterfly composition can point to subtle changes in forested habitat.
- Continue to study the effect of weather conditions, time of day and time of year on butterfly monitoring, allowing us to understand more about butterfly ecology.
- Monitor the long-term changes of butterfly species populations with a particular focus on habitat-restricted species temporally at fixed sites in the park. There are many ongoing activities that affect butterfly populations: habitat disturbance is still occurring annually in the study area, vegetation is being destroyed, the local road was widened, bamboo shoots are being picked, etc.

We will also address the following questions:

- Are there any short- and/or long-term changes in species composition and populations in the study area from year to year? Species populations of local butterflies, especially forest-restricted species, in a long-term study on fixed sites can detect actual information of butterfly populations in Tam Dao.
- What are the long-term changes in local butterfly populations? It will be important to study butterfly populations on fixed transects over the long-term to determine conservation measures to protect not only butterflies but also other animals and plants.
- What is the real status of species that are threatened or endangered due to habitat disturbance and over-collection, and which species are tolerant versus which are sensitive to habitat disturbance?
- How do the weather conditions and different times of the day impact butterfly activities? It is hypothesized that these factors impact butterfly activities more in open areas and less in forest.

We will continue to look for food plants and other life history information on butterflies especially rare and highly valuable species. Determining the food plants of butterfly larva will

help in establishing butterfly farms in the park. We will also survey the status of rare and threatened butterflies collected in the park.

Butterfly Collection Methods

With practice, it should be possible to identify many butterflies by sight. However, while some species are instantly recognizable, others need to be caught for identification and then released. Butterflies can be collected using nets or traps. The nets consist of a plain bag of mosquito netting or another soft, transparent material. The corners should be rounded to prevent damage to butterflies, and should have a broad cotton hem for the framework to run through.

Skill in catching butterflies is a matter of practice and experience. Ideally, butterflies should be caught in a sweeping motion that drives them into the end of the net, taking care not to damage the net on bushes and thorns and twisting the net over itself to prevent its escape. Usually one waits until the butterfly has settled. If the butterfly settles on the ground, drop the framework over it and hold the net up. When the butterfly flies upwards sweep the net below it to capture it.

Butterflies should be handled as little as possible. Their wings are covered with minute scales that are easily dislodged when handled. If butterflies are moved, they should be handled using blunt forceps (entomological forceps) or very carefully with fingers by the body rather than the wings.

The following information should be recorded on the butterfly datasheet (see the appendix):

- Day, month and year
- Recording start and end time for every transect
- Transect number
- Recorder (the person who takes notes on datasheets)
- Weather conditions (sun, cloud cover, wind, temperature, relative humidity, mist, rain, etc.)
- Number of species and individuals recorded in each transect

Transect Methods

Butterfly transect methodologies were developed in England by Pollard (1975, 1977) for monitoring changes in a butterfly species population over time. They can be also used to study differences in the butterfly communities of different habitats. This method was modified to apply in Vietnam in recent years by Spitzer *et al.* (1987, 1993), Vu and Dang (2002), and Vu and Yuan (2003).

The transect is a line segment along which butterflies are studied. A method based on transect counts is used to assess changes in the abundance of habitats of butterflies from year to year. Transects will be split into sections and delineated by red paint marks on trees at 40-200 m intervals (mostly sections of 100 m in length) depending on different habitats in each transect.

The transects consist of:

- Closed forest with canopy height of 5-13 m and forest cover 70-80%
- Disturbed forest with canopy height of 3-10 m and forest cover 55-60%
- Regenerating forest with grass cover 60-80%
- Area along the local village road with forest cover 10-15%
- Disturbed forest and shrub from 950-1,200 m elevation with forest cover 50-60% (new transect made in 2005)
- Mixed closed forest with bamboo and small to medium trees and forest cover 70-80% (new transect made in 2005)
- Mixed closed forest with bamboo and trees from 950 m-1,350 m elevation and forest cover 70-80% (new transect made in 2005)

Some sections of different transects are similar, so all sections of all transects are grouped in four different habitat types: closed forest, disturbed forest, shrub and regenerating forest, and open grass and agriculture land.

To complete a transect, the following will be necessary:

- At least two persons (preferably three or more)
- Collecting equipment (butterfly nets)
- Recording equipment (datasheet, pencil, board)
- Guidebook to butterflies of the project, compiled by PI

The recorders will walk at a uniform pace and record all butterflies seen within prescribed limits. The transects are restricted to roads and paths, the boundaries of which are generally obvious. The recorders walk and record butterflies in an imaginary 5x 5x 5 m box. Individual butterflies, after being counted by a recorder, sometimes fly ahead of recorders and risk being double counted. To avoid this, an entry will be made only when there is no doubt that the butterfly being counted is the only one present.

In addition to butterfly surveys, vegetation along all transects within 2.5 m of either side are recorded, especially butterfly food plants. The identification of vegetation will follow Pham (1999) and some other sources. Any change and disturbance of vegetation will be also recorded during transect surveys.

Butterfly Identification

According to the current classification system, Vietnam has 11 butterfly families and Tam Dao also has 11 families, but only 10 families are present in the project site. These families are:

- *Papilionidae* (*birdwings and swallowtails*): The family includes many large, active and often colorful butterflies. Many species have tailed hind wings, although some are tailless. Swallowtails often fly high. They are found both in open and forest areas.
- *Pieridae* (*whites and yellows*): The butterflies in this family are of moderate to fairly small size. The predominant colors are white, yellow, and orange-yellow, and there are often dark apical patches on the forewings. The butterflies are never tailed. The largest in Tam Dao is the great orange tip (*Hebomoia glaucippe*). The butterflies often congregate on the roads or at puddles.
- *Danaidae* (*tigers and crows*): The Danaids are all medium to large butterflies, often strikingly marked in black, orange or white. The body is elongated and usually black with white spots. The forelimbs are reduced and useless in both sexes. Most species are found in open, sunny habitats where they feed on flowers. The larvae may feed on poisonous plants, which makes them inedible to potential predators such as birds. They may also be brightly colored, as a warning. Some harmless butterflies from other families mimic the Danaids, also to deter potential predators.
- *Satyridae* (*browns and arguses*): Species of this family are small, brown and gray butterflies of medium size with short, broad wings. Most have scalloped hind wings, and wings are usually marked above or below with ocelli (eyespot). They are found in all habitats although some only fly in forests. They are not powerful fliers and stay close to the ground.
- *Amathusiidae*: The Amathusiids are large forest butterflies. Like the Satyridae, the forelimbs are reduced and the wings may have eyespots, although these are less pronounced and the butterflies are often particularly colorful. Most of these butterflies are found in forests.
- *Nymphalidae*: The Nymphalids are a very large family of butterflies with a great variety of shape, bright colors, and markings. The family includes many large, strong fliers. Many

species are attracted and found in open and sunny areas. However, there are a number of species which are restricted to forest.

- *Acraeidae*: The members of this family are yellow or tawny. They have long forewings and rounded hind wings. There is one species in Tam Dao.
- *Riodinidae* (*punches and judies*): Butterflies of this family are small, delicate-looking butterflies which may be mistaken for Lycaenidae. However, most Riodinids are predominantly brown and white. The wings are short and broad, and forewings are falcate (sickle-shaped) with a truncated apex. The butterflies are found in forest edge and in the open as well as in forest.
- *Lycaenidae* (*blues and coppers*): The Lycaenidae is a large family of small butterflies, many of which have tailed hind wings. The predominant colors are blue, green, orange-brown, or white. Metallic colors are common. The underside of the wings tends to show complex patterns in shades of gray and brown. Species of this family are difficult to identify.
- *Hesperiidae* (*skippers*): Another large family of small butterflies, the Hesperids are distinguished from all other butterflies by their short, wide bodies and relatively short wings; they look more like moths than butterflies. The clubbed or hooked antennae are set wide apart on the head. Some species hold their wings distinctively when at rest; the wings are held at about 45° to the body, whereas most butterflies hold their wings closed. Like the Lycaenidae, Hesperiid species are very difficult to distinguish. Most are grey or brown with lighter markings, although some are more colorful. Hesperids are found in all habitats and are best collected in the early morning or in the evening as many are rather crepuscular in their habitats. Many appear to be rather territorial. Some of these butterflies will be recorded only to Genus.

Butterflies often vary locally, seasonally and individually, and sometimes the difference between two species might be very minute. Therefore, recorders will check identifications with the descriptions given in the guidebook provided by the PI, first referring to the information given for the genus and secondly to that for the species. Familiarity with the structure of the butterfly's wing and the peculiar structures used in the description of the markings is essential. It is important to remember that the identification of butterflies is a difficult task and even experts sometimes have difficulty in naming a specimen. Preserved specimens and photos of different butterfly species will be available for reference and to take to the field for identification.

In recording butterflies along transects volunteers should know how to distinguish butterflies from moths, as sometimes both fly along transects. The most important way to distinguish butterflies and moths is by the antennae. Butterflies tend to have clubbed antennae, meaning each antennae ends in a thickened knob (though in skippers the club may be hooked), while moths have antennae that taper to a point. Additionally, butterflies are able to fold their wings up vertically over their back, while moths often hold their wings horizontally. Butterflies tend to have large, more colorful or more boldly patterned wings than moths, and butterflies fly during the day while moths are mostly nocturnal.

17. RESULTS AND OPPORTUNITIES

Conservationists and environmentalists were able to use some forest butterflies as ecological indicators to quickly and easily evaluate forest disturbance in protected areas. This project's results helped increase our knowledge about butterfly ecology. The project also helps young scientists, especially staff of the park, gain experience using relevant methodology to study butterfly communities in Vietnam, and helps them use butterfly transects to conduct surveys in order to compare butterfly communities in different habitats.

The butterfly transect methodology and application are still unfamiliar in Vietnam. This pioneering project of organism monitoring will encourage the development of similar projects in Vietnam in the future. Long-term monitoring will show real changes of butterfly species populations in order to get practical information on negative trends in conservation efforts in the park and in Vietnam. Research focuses on temporal changes in the biota and will be used by managers of protected areas to evaluate the success of their policies and to develop strategies on how to meet conservation objectives. It will give practical data through long-term monitoring on which species of butterfly are rare and endangered or at risk of extinction. The information will be used to urge resource managers and policy makers to take relevant conservation measures to protect butterflies as well as other organism and forest ecosystems.

Data on histories of butterflies such as larvae, food plants of larvae, habitat requirements, behavior, species composition and distribution recorded in this study are very valuable to the conservation of butterflies. This data will be used to compile a field guidebook of butterflies of Tam Dao as well as to establish butterfly farms in the future. These farms would bring cash to local people by exporting farmed products and would help preserve the forest in the park. The establishment of the first of such farms began in 2005 and so far we have started planting some food and nectar plants for butterfly larvae and adults in the park as well as in a garden in Tam Dao village.

Public awareness of environmental problems in Vietnam in general is very low. The park is one of the best areas for educating visitors about the value of wildlife and human responsibility to conserve the environment for present and future generations. The participation of Earthwatch volunteers in this project positively influences the park, the director of the park, his staff and the local communities. It shows that foreigners are concerned about conservation, and will be helpful in encouraging the local communities to also be concerned about wildlife conservation in the park. We have shared our findings with the director of the park and his colleagues as well as the local community, and we explain to local people, visitors, and students of the local school about the important role of butterflies as indicators and as plant pollinators. We also show local pupils pictures of beautiful and precious butterflies with vegetation and flowers that should be preserved.

While it is not easy to stop negative disturbance by humans in the Tam Dao National Park due to the developing economy of the area, this project's long-term monitoring will contribute to future conservation measures by detecting the reduction and extinction of butterfly species.

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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
- Visa and/or passport (if necessary)
- Certification of inoculation (if necessary)

Required Items

Clothing/Footwear for Fieldwork

- One or two pairs of lightweight, quick drying, long-sleeved shirts and trousers (long sleeves may be beneficial for those sensitive to the sun)
- Warmer clothes such as a sweatshirt/jumper and long trousers for cool evenings
- Well worn-in, sturdy, and comfortable hiking boots or shoes
- A very lightweight rain poncho that can cover your backpack, camera, etc. (lightweight rain trousers also useful)
- Hat with wide brim to protect you from the sun (very important)
- Long and thick socks to tuck your trousers into to protect against leeches

Clothing/Footwear for Leisure

- One nicer set of clothing to keep clean for end of expedition or tourist activities (long skirts or long trousers are appropriate for visits to pagodas and temples)
- T-shirts and shorts
- One pair of sandals/flip flops/thongs

Field Supplies

- Small daypack/rucksack
- Drybag or plastic sealable bags (good for protecting equipment such as camera from dust, humidity and water)
- Insect repellent spray
- Water bottles (minimum of two 1-liter bottles)
- Headlamp or flashlight/torch with extra batteries (the electricity cuts out from time to time, particularly in the evenings)

Bedding and Bathing

Note: Sheets, blankets, pillows and towels will be provided by the project hotel; however, you may wish to bring an extra towel if you plan to swim at one of the nearby pools.

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 in Vietnamese dong (traveler’s checks and credit cards can be used in cities and big tourist sites in Vietnam, but not in local areas)
- Camera, film, extra camera battery

Optional Items

- Binoculars
- Travel guide, books, games, journal, etc.
- Favorite snack foods
- Sunglasses
- Swimsuit (there are two swimming pools in the area)
- Earplugs