EARTHWATCH INSTITUTE
FINDING SOLUTIONS FOR A SUSTAINABLE FUTURE

Dear Volunteers:

Thank you so much for your involvement in the “Costa Rica’s Monkeys” expedition this summer. It was wonderful meeting and working with you all. Now that you’re back in school and winter is coming, I hope you’ll enjoy reflecting back on our time together in the tropics.

This year was the third season of the project, which has been put on the back burner for a few months while I finish my dissertation. Since it may be a while before I can get back to Curú, the summer was a great opportunity for me to catch-up with the monkeys. We were lucky to have this chance to conduct an interesting pilot study on novel foods with the howler monkeys. Together, we also collected about 25 hours of behavioral data. This does not include the time we spent tracking, waiting for, or chasing the monkeys, so it is quite a substantial amount of data.

This summer’s efforts at public education centred on the creation of a radio segment for “Pulse of the Planet”, a short environmental program that airs on public radio. Our project will be featured in four episodes set to air in December, with a few more in the works for January. Check their website (www.pulseplanet.org) for information, or to listen to other feature stories starring Earthwatch PIs and volunteers.

In the following report, you can read an update of the work completed up to November, 2008 and what we have been able to accomplish with all of your help. As you know, this is a relatively new project, and academic publication is a slow process. I will try to keep you all updated as I begin to publish the results.

Lastly, I want to mention that Teen Teams are so important to Earthwatch’s mission. We are always impressed by your maturity and hard work, and are so proud to be a part of your education. I hope that you share a little bit of your Costa Rican experience with your families, friends, and classmates. And, of course, you are all encouraged to stay in touch, and keep me posted on your travels and academic adventures.

Best to you all, and happy travels....

Tracie

EARTHWATCH INSTITUTE ANNUAL FIELD REPORT

Project title: Costa Rica's Monkeys
Date completed: November 4th, 2008
Completed by: Tracie McKinney, Principal Investigator (PI)
Period covered by this report: June 2008 to July 2008

Reporting on research objectives

1. Provide a summary of progress this year towards each of the objectives stated in your most recent research proposal.

Objective 1: Understand impact of human disturbance on neotropical primates

This third season of work with Costa Rica primates leaves me with over 1500 hours of behavioral data, plus ranging patterns and habitat information to analyze. At this point, there is sufficient data to develop a thorough picture of habitat disturbance and human interaction at this site, which will help build a baseline of information regarding human-primate interactions throughout the tropics. My dissertation, which is scheduled for completion in Spring 2009, addresses several parameters of monkey life which face particular influence from disturbance, including:

- ranging patterns and home range size
- diet and crop-raiding
- activity budgets
- population parameters such as group size, infant to adult ratio, male turnover and infanticide risk
- aggression and group cohesion
- novel (non-native) predation risks with habitat disruption

Objective 2: Explore the strategies used by different monkey species to adapt to disturbance

Mantled howlers (*Alouatta palliata*) and white-faced capuchins (*Cebus capucinus*) are two of the best-studied monkey species in the neotropics. We are already knowledgeable of these animals' ecological niches and basic behaviors, but have not placed much emphasis on the incredible diversity of diet, habitat and behavior patterns found among different populations of these species. This study allows us to compare capuchin and howler parameters within a highly disturbed environment both with comparable troops nearby and with the overall variation typical of the species elsewhere in Costa Rica. Capuchins seem to be dealing with modified change on the basis of their omnivorous, opportunistic foraging techniques. Howlers however, are generally assumed to survive well in damaged areas because of their

foliverous (leaf-eater) diet when in fact, howlers at this site are surviving in altered habitats by using the same method usually seen in capuchins – high quantities of fruit gained through raiding agricultural lands.

Objective 3: Explain why these species survive well in damaged habitats, where others do not.

Work has not commenced on this objective to date. To fully understand why howlers and capuchins are surviving well in damaged habitats, while similar taxa are not, we will need to apply the same/similar research methods to other Costa Rican species, which is outside the scope of this project. To some extent, the finished data analysis can be compared to the literature on other neotropical species, and as much meta-analysis as possible will be presented in my dissertation. Ideally, I would like to replicate this study with the two other Costa Rican species, the red-backed squirrel monkey (*Saimiri oerstedti*) and the black-handed spider monkey (*Ateles geoffroyi*) to create a natural comparison for the groups.

Objective 4: Improve management policies for ecotourism, agricultural and urban development.

Last year, I was approached by the manager of Curú Wildlife Refuge with questions about the behavior of some of the nature guides, who often "howl" or shout at the monkeys to invoke a response for the tourists. This is a tricky area, because the park is funded by tourist entry fees, and they want to see and hear the howler monkeys, but as conservationists we do not want to disturb the animals any more than necessary and want to teach tourists to respect the local wildlife. While my thesis is my immediate goal right now, I plan to prepare a management document for Curú by next summer, outlining the effects of such interaction on these animals and making recommendations for sustainable interactions between wildlife and tourists.

It will be some time before any larger-scale (regional or national) impact can occur from this study. Curú is often viewed as a model for agricultural areas working in conjunction with wildlife conservation, and any improvements we can make to their system will serve as an example for others.

Objective 5: Educate the local and global communities about primate habitats and conservation.

In the last few years, we have had the opportunity to provide various educational outlets for the local community. For example, the year-long 2007 field season included a day-long program for local high school students to learn about conservation science in their region; short trips with volunteers to high school and elementary school students in Paquera and Valle Azul; a short segment on "TeleTica", a Costa Rican national news program; and countless informal interactions between the researchers and volunteers and visitors to the wildlife refuge. The 2008 field season consisted of only two 10-day teams, so we did not have the opportunity to instigate local educational efforts apart from talking with tourists and local community members.

Global educational efforts include both mass media outlets for public education and presentation to the scientific community. I have presented the results of my work at two scientific conferences this year (the American Association of Physical Anthropologists and the Midwest Primate Interest Group meetings), and have one research paper under review with the journal *Neotropical Primates.* Mass-media efforts include a segment on the

television show *Get Fresh with Sara Snow*, which aired in July 2007, and upcoming segments on the radio program *Pulse of the Planet*.

My project has now run four all-teen teams, which I consider an important part of Earthwatch's educational mission. Teen teams involve students in real-world research, and can help them develop as future scientists, conservationists, or educators. Many of my students, on both teen and standard teams, have taken the lessons learned on Earthwatch expeditions back to their classmates through school presentations.

Project development

What logistical or scientific challenges have you encountered in the past season and how will you address these during the next field season?

This summer's short season was without major scientific challenges. I modified last year's data sheets to make them a little more user-friendly for volunteers, and I believe this improved data collection. We attempted a short novel-food study with the howler monkeys, which was not terribly successful. If a second pilot study is attempted, we have at least worked out some of the issues of presenting foods to animals living high in the canopy.

Non-technical summary of results

1. Give an account of the data collected and results (inputs and data) for the period covered by this report, mentioning any emerging trends.

The summer 2008 season consisted of two 10-day teen teams. With such a short season, we of course could not collect the massive quantities of data collected in the 2007 season. The short trip was a great success, however. We added about 25 hours of behavioral information to my database, yielding well over 1500 hours for the project to data. We conducted an informal pilot study on novel food use with the howlers, providing me with some ideas for practical application of a full study in the future. This trip allowed me to catch up with my monkey troops, confirming that their daily patterns and home ranges have not changed since last year. We also had the opportunity to check on group sizes, births and deaths, and get a solid measure of infant loss and male turnover in the Banana Gang, the troop facing the most extreme levels of disturbance in the park. Most importantly, the short summer season allowed for the involvement of high school students, providing them with a great field experience while introducing local people to foreigners fascinated by their endemic wildlife.

I am currently in the process of writing my dissertation, so results from this study are being analyzed and are in need of further organization. I expect to begin disseminating the results of this study to academic journals within the year, but below are some major areas of discovery thus far:

- **Male turnover rate and infanticide in capuchins:** Our human-disturbed capuchin group, the Banana Gang, has shown several atypical social behaviors over the past year. The most alarming deals with their alpha male turnover and aggression directed towards nursing infants. The average reign for an alpha male in this species is about four years, but Banana Gang has had three alpha males in 2007 alone. During the period of these two take-overs, Banana Gang's infant survival rate was about 15%. During the years of 2006 and 2008 (so far) the infant survival rate approaches 100%. This astounding difference in infant survival during times of take-over has been reported in other species, but the important factor here is the

rate of take-over. If these periods of high infanticide occur every 4-5 years, the population can recover. If, as many believe, habitat disruption and population saturation trigger these turn-over events (and subsequent infanticides) these monkeys face a major threat to their continued survival.

- **Crop-raiding and use of agro-ecosystems:** When wildlife is forced to survive in human altered (or "anthropogenic") habitats, they often take advantage of alternative food sources, such as crops or garbage. Primates in general are well-known for crop-raiding, although some species are more likely to become "pests" than others. Omnivorous, ground-dwelling primates such as baboons and rhesus monkeys are common crop-raiders, while specialist, tree-living species are rarely observed taking human foods. Clearly, then, one would expect the capuchin monkeys at Curú to use human foods, but we were surprised to find that the howler monkeys also regularly feed on crops. While specialized for leaf-eating, howler monkeys also include fruit in their diet. Our howlers are eating a much higher proportion of fruit than typical for their species, which could impact their overall nutrition, reproductive cycles, and activity patterns.

- **Aggression levels within and between troops:** Some authors suggest that increased environmental stress, such as habitat fragmentation or inconsistent food availability, result in increased social stress within a monkey troop and increased competition between adjacent troops as well. This will be clear after analyzing social interactions, as recorded through focal animal follows, and measuring the frequency and consequences surrounding aggressive encounters.

- **Ranging behavior, home territory size, and activity budgets**: One of the most noticeable impacts of living in an anthropogenic habitat is the shift in ranging behavior. Because provisioned food sources, such as crop stands or food handouts, are reliable and usually of high caloric value, primates with provisioned food sources are expected to require less time and space in which to find their food. However, our disturbed study troops appear to have larger than average home territories, which could be explained by fragmentation of their territory (i.e. not all of their home range is useable). Disturbed monkey troops also appear to expend more energy than their forest counterparts, travelling longer distance and engaging in more social behaviour and play. This may be related to the higher energetic content of provisioned food sources.

- **Changing predator risks:** Most scientists acknowledge that one benefit monkeys may receive from living near human settlement is a decreased risk of predation. Many predators do avoid human settlements, but some rely on livestock, others are attracted to garbage and other wastes, and still others prefer hunting in open areas. Predation risk is bound to change with habitat alteration, but new predation risk may appear in place of old predators. Monkeys in several other locations have been killed by domestic dogs, for example. At this site, we witnessed a predation attempt on infant howling monkeys by an open-area raptor (*Caracara plancus*) which is not reported to prey on monkeys. These birds thrive in human-altered habitats, and can become a major risk for wildlife confined to corridors or narrow strips of forest. The threat of new predators could be a major concern for primate populations, as they likely lack the selection-driven behavioral adaptations to avoid these predators.

2. How do these data contribute to achieving conservation impacts? (e.g. actions based on results, management plans, site protection)

Data from this project will help us understand the level of disruption close human habitation imposes on wild primate societies. While these animals may appear to be doing well, findings like the low reproductive success of Banana Gang indicate that continued stress may be unsustainable. Examining the extent of behavioral change between anthropogenic-living primate groups and their nearby conspecifics (individuals belonging to the same species) will help us determine if the behaviors seen in disturbed groups are suitable for their continued survival. If not, we will need to make some serious adjustments to reduce our impact on these animals. Working together with local landowners and lawmakers, this data can provide vital information for creating management plans that are in the best interest for all involved – the wildlife, the landowners, and the community.

3. What is/ are the significance/ benefits of your research at the following levels?

- **Local (to the area of the research site)**.

  The benefits to the local community are two-fold: educational and financial.

  - With the help of Earthwatch volunteers, our project has implemented a number of educational activities for the local community. Volunteers have taught lessons at local elementary schools, and we created educational materials (games, posters, etc) for area students. Curú also hosted a "science day" event for local high school students, where they met scientists working in their communities, discussed environmental concerns, and provided suggestions for improving the ecological situation in their towns.

  - The financial benefits to the community are also significant. The income generated from Earthwatch contributions (food and accommodations for volunteers, plus extra spending in the gift shop) has made a huge impact on Curú. Over the past two years, Curú has improved all six tourist cabins, built a new gift shop and dining hall, and built an improved enclosure for orphaned spider monkey. As a working farm, Curú is also one of the largest employers for the communities of Paquera and Valle Azul, so their success trickles down to many local families.

- **National / Regional**. Costa Rica is known worldwide as an ideal destination for ecotourism, and people spend millions of dollars each year enjoying the natural beauty of the country. One of the best investments Costa Rica can make is to ensure the continued survival of their wildlife. By supporting conservation-based research, we can ensure that tourist destinations and wildlife refuges are run to the best of our knowledge, and that we are protecting the very creatures that draw tourists in the first place.

- **International.** The international scope of this project falls into the realm of academic advancements in the field of primatology. The study of how primate populations deal with the ever-increasing pressure of human presence has become an important focus in recent years, and will grow as a subfield of primatology over the next decade. To date, a number of significant studies have examined commensalism (where one species benefits from a second species, and the second species is not adversely affected) in old world primates (those living in Africa and Asia), but very little is known about the situation in Latin America. As the fastest-urbanizing region

in the developing world, Latin America is a vital area for a focus on human-wildlife conflict.

Communication of results

Please list all dissemination outputs for the period covered by this report, or outputs soon to be released, for the categories below.

Printed:

McKinney, T. Anthropogenic change and primate predation risk: Crested caracaras (*Caracara plancus*) attempt predation on mantled howler monkeys (*Alouatta palliata*). [Under review by *Neotropical Primates*]

Visual:
As always, Earthwatch is welcome to use any photos from this or previous field seasons.

Mass media:
Forthcoming episodes for *Pulse of the Planet* – scheduled to air in December 2008 and January 2009.

Meetings and conferences:

McKinney, T. Population dynamics of provisioned white-faced capuchins (*Cebus capucinus*) at the Refugio Nacional de Vida Silvestre Curú, Costa Rica. Presented at the 5th annual meeting of the Midwest Primate Interest Group, South Bend, IN. Sept. 2008.

Educational Opportunities

1. Does your project directly or indirectly involve the following groups in your research topic?

- **Local communities:** So far, this project has had its greatest education impact on the local community. We have made efforts to provide conservation-based educational materials for local schools, such as games and posters. Volunteers have visited area elementary and high schools, and have taught lessons and played educational games with the students. Curú hosted an all-day science program for area high school students, where they listed to presentations from scientists working in their communities and discussed ways they can help the earth and their wildlife.

- **Students:** This season's fielding was dedicated to Teen Teams, and 12 students participated in field research this year.

- **Early career scientists:** The PI for this project is an early career scientist! This research forms the core of my dissertation research, and is providing me with a solid base of data from which I can contribute to the academic discussion.

2. How does your research help these groups better understand and act towards the conservation of a sustainable environment?

For local communities, the very presence of a research team piques their interest and impacts their consideration of local wildlife. Monkeys are commonplace to most Ticos, and are often considered pests, so many do not realize that they are at risk. Most local people are very interested in the volunteers, and are amazed that people would come so far to chase monkeys around in the rain. Seeing others care about their wildlife reminds local people about the importance of their corner of the world.

For students, seeing these animals first hand, in their natural environment, is the most important way to truly understand their importance. It is easy to ignore environmental issues until they are right in front of you.... seeing them as individuals, with a family and a life and a personality, really makes the importance of wildlife conservation hit home.

3. Has your project contributed to the completion of Masters' or PhD theses or degrees, or other educational research findings?

The PI expects to complete her PhD thesis based on this research by spring 2009.

Acknowledgements

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