

# Cotlow Award Application Form 2009

Department of Anthropology

The George Washington University

Washington, DC 20052

## 1. Personal Information

Applicant's name: Katherine Schuhmacher

Degree sought: Bachelor of Science, continuing on to receive a Doctor of Veterinary Medicine

Field of study/major/minor/concentration: major: Biological Anthropology, minor: Biology

Expected date of graduation: May 2010

Faculty Advisor(s): Dr. Peter Lucas

## 2. Language Skills

Does the proposed project involve the use of a "field language"? No

If yes, state what the language is and your degree of fluency in speaking, reading, and writing it:

## 3. Title of the Project and Abstract

Project Title: Influence of efficient tool-use on social rank in two groups of tufted capuchins

### Abstract of the Project

The goal of this project is to investigate the relationship between the efficiency of tool-use behaviors and individual's social rank in two groups of wild, habituated tufted capuchin monkeys (*Cebus libidinosus*) in Piauí, Brazil. Feeding behaviors will be recorded using group scan and focal animal continuous sampling methods. Results of this study will examine the influence of maternal dominance rank on offspring's tool-use efficiency and improve our understanding of tufted capuchin tool-use behavior.

## 4. Description of the Project

Capuchins are omnivorous New World monkeys that forage for nutrient-rich foods that are often difficult to open or extract, such as palm nuts or insect larvae located within bamboo stalks or underneath tree bark (Izawa 1980; Terborgh 1983; Gunst et al. 2008). In addition,

capuchins have been observed using objects in their environment to access these foods (Panger 1998; Panger et al. 2002). The overall goals of the proposed observational behavior study are to evaluate whether tool-use skills are an important factor in determining an individual's social rank and to determine if an individual's maternal rank strongly influences their ability to master complex tool manipulation. I will conduct this research on two groups of wild tufted capuchins (*C. libidinosus*) observed to use stone hammer and anvils to crack open palm nuts at Fazenda Boa Vista (9°S, 45°W), Piauí, Brazil. Boa Vista is an established field site where the EthoCebus research team has been conducting research since 2005. The site is part of a biological reserve and is characterized as a dry savannah-like environment (Madden et al. 2007). Data collection will be conducted during the early dry season (May-July), when the palm nuts are abundant. I will be assisting Janine Chalk, a HPDP graduate student with research experience at this site, who will offer guidance while in the field. Results from this project will contribute valuable information on individual differences in tool-use behaviors and how efficient tool-use influences social rank in these primates.

## **5. Significance of the Project to Anthropology**

Although their diets largely consist of ripe fruit, previous research has demonstrated that capuchins turn to foods like hard seeds or fruits, such as palm nuts, and insects embedded in bamboo or beneath the bark of trees to sustain themselves, especially during the dry season when fruits are unavailable (Izawa 1980; Terborgh 1983; Fragaszy et al. 2004a). In the wild, capuchins pound open the husks of hard seeds and palm nuts in order to access the nutritional component of these foods or employ a tapping behavior to locate insects in tree branches (Panger 1998; Panger et al. 2002). Further research has also discovered that the use of tools and the variety of "tool kits" used varies between populations, and suggests capuchins may have cultural traditions similar to those of chimpanzees and orangutans (Panger et al. 2002). For example, the tufted capuchins (*C. libidinosus*) at Boa Vista have been observed to use a hammer and anvil strategy, by placing the nuts on rock outcrops, boulders or logs, and pounding them with river rocks (Fragaszy et al. 2004b).

There has been much investigation into the role of social learning in the transfer of tool-use behaviors in capuchins. Panger (2002) postulates that the capuchins' relatively large brain size, manual dexterity, sensorimotor intelligence, omnivorous diet, and high tolerance of juveniles observing foraging behaviors all contribute to an atmosphere that is conducive to social learning. Ottoni and Izar (2008) note juveniles watch adults skilled at nutcracking intensely and often pick up foods discarded by adults. Interestingly enough, it has been observed that while juveniles are tolerated during foraging, young adults are "exiled to the group periphery until they attain higher social rank," and it is presumed that "attainment of high status is more likely among brown capuchins who are adept and successful foragers" (Fragaszy and Perry, 2003, p. 381). Since all juveniles are essentially given the same opportunity to observe and learn from the most skilled members of the group, it would be interesting to determine if some juveniles were more successful at using tools based on the skills of their parents. Based on previous research, I will investigate whether an individual's social rank correlates with more efficient tool-use skills and the role of maternal dominance rank in her offspring's efficiency in using tools to access palms. The results of my research will help advance our understanding of the relationship between social structure and foraging behaviors in capuchins.

## **6. Methods**

This research will address two specific research questions:

1. Is efficient tool usage correlated with an individual's social rank?
2. Are offspring of dominant mothers more efficient at using tools than offspring of subordinate mothers?

Capuchin behavior will be monitored during daily follows, and observation of the groups will alternate after all focal individuals are observed. Based on the extensive research done on these groups, data outlining pedigree and rank information is available on a majority of the individuals. In addition, I will use 'ad libitum' sampling (Altmann 1974) to collect data on social rank based on my observations of aggressive behaviors including fights or chases that occur between individuals following Janson (1985).

I will combine two observational sampling methods to provide more detailed behavioral records. First, I will use scan sampling of the whole group to determine the percentage of time individuals devote to an activity. These group scans will follow a simple ethogram in which each individual is identified. I will record their basic behaviors (travel, rest, play, forage, groom, or other) and proximity to other individuals. Second I will use interval sampling of focal individuals to record feeding behaviors, including tool-use. Tool-use behaviors will be recorded using a separate ethogram provided by J. Chalk, which follows the object use descriptions of Panger (1998) and Panger et al. (2002). For focal individuals, I will record the time in minutes needed to open a nut, the number successful nutcracking attempts, and the total number of nutcracking attempts.

I will compare data from individuals of both groups to see if there are significant differences in tool-use behavior and if this difference correlates to the individual's social rank. Differences among juveniles and young adults will also be compared to determine if offspring of dominant mothers are more efficient at tool-use.

## **7. Research Ethics**

The sampling methods employed in this research adhere to the ethical guidelines for non-human primate field research described by the American Anthropological Association and the American Society of Primatologists.

There will be no direct contact with the primates. All observations will be taken from a safe distance. All materials brought into the field will be brought back to camp, leaving the ecological site intact. I will ensure that my research will not harm the safety, well-being, or survival of the species I will be working with, and I will make sure to preserve the site for future fieldworkers.

## **8. Research Product**

The product of the proposed research will be published in peer-reviewed journals and presented at the annual Anthropology Student Research Conference in 2009, and has the potential to be used as a part of my honors thesis research.

## **9. Timetable**

May 10-July 25, 2009: Travel to the Boa Vista field site in Piauí, Brazil. Collect observational data on tool-use behavior and social dynamics in tufted capuchin groups at Boa Vista and discuss methods and preliminary results with J. Chalk and other colleagues.

August-September 2009: Analyze and prepare data for publication and presentation at the Anthropology Student Research Conference.

## 10. Budget Amount and Projected Expenditures

Total Amount Requested: \$1,715.00

### Projected Expenditures

Complete budget for proposed project:

Flights:

Roundtrip airfare Washington, DC to São Paulo, BR, quoted from <www.orbitz.com>	\$1,087.00
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Roundtrip airfare São Paulo to Brasilia quoted from TAM airlines <www.tam.com/br>	\$208.00
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Accommodation:

Lodging in São Paulo (2 nights) quoted from <www.orbitz.com>	\$220.00
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Transport:

Taxis to/from airports	\$200.00
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Roundtrip bus fare from Brasilia to Gilbues	\$250.00
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Hired vehicle for transport between Gilbues and Boa Vista field site	\$100.00
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**The Cotlow Grant will cover the flights, accommodation, and taxis to/from airports.**

## 11. Staff

Janine Chalk (GWU) and Dr. Barth W. Wright (Kansas City University of Medicine and Biosciences) are experienced with the observational sampling methods and will participate in the proposed research as investigators.

The proposed research will be conducted in collaboration with the EthoCebus research team. This is a group of international researchers and their students whose aim is to investigate the ecology and behavior of these primates. The team consists of faculty from three institutions: Dr. Dorothy Fragaszy from the University of Georgia (U.S.A.), Drs. Patricia Izar and Eduardo B. Ottoni from the University of Sao Paulo (Brazil), and Dr. Elisabetta M. Visalberghi from the Consiglio Nazionale delle Ricerche (Italy).

## 12. Outside Financial Support

My parents will cover any additional expenses that exceed the award amount.

### 13. References Cited/Select Bibliography

1. Altmann J. (1974) Observational study of behavior: sampling methods. *Behaviour* 49:227-65.
2. American Anthropological Association, Code of Ethics. (1998). Accessed March 3, 2009 from <http://www.aaanet.org>.
3. American Society of Primatologists, Principles for the Ethical Treatment of Non-Human Primates (2004). Accessed on March 5, 2009 from <http://www.asp.org/society/resolutions.EthicalTreatmentOfNonHumanPrimates.html>.
4. Fragaszy D.M., Boinski S., Whipple J. (1992) Behavioral sampling in the field: comparison of individual and group sampling methods. *Am J Primatol* 26:259-275.
5. Fragaszy D.M., Visalberghi E., and Fedigan L.M. (2004a) *The Complete Capuchin. The Biology of the Genus Cebus*. Cambridge: Cambridge University Press.
6. Fragaszy D.M., Izar P., Visalberghi E., Ottoni E.B., and Oliviera M. (2004b) Wild capuchin monkeys use anvils and stone pounding tools. *Am J Primatol* 64:359-366.
7. Gunst N., Boinski S., and Fragaszy D.M. (2008) Acquisition of foraging competence in wild brown capuchins (*Cebus apella*), with special reference to conspecifics' foraging artefacts as an indirect social influence. *Behaviour* 145:195-229.
8. Izawa K. (1980) Social behavior of the wild black-capped capuchin monkey (*Cebus apella*). *Primates* 21:443-67.
9. Janson C.H. (1985) Aggressive competition and individual food consumption in wild brown capuchin monkeys (*Cebus apella*). *Behav Ecol Sociobiol* 18:125-38.
10. Madden M., Hinley A.J., Fragaszy D., Visalberghi E., Ottoni E., and Izar P. (2007) Modeling the monkey habitat in Brazil. *Geospatial Today* 5:26-35.
11. Moura A.C. de A., Lee P.C. (2004) Capuchin Stone Tool Use in Caatinga Dry Forest. *Science* 306:1909.
12. Ottoni E.B. and Izar P. (2008) Capuchin monkey tool use: overview and implications. *Evol Anthropol* 17:171-8.
13. Panger MA (1998) Object-use in free-ranging white-faced capuchins (*Cebus capucinus*) in Costa Rica. *Am J Phys Anthropol* 106:311-21.
14. Panger MA, Perry S, Rose L, et al. (2002) Cross-site differences in foraging behavior of white-faced capuchins (*Cebus capucinus*). *Am J Phys Anthropol* 119:52-66.

### 14. Permits

Research permits for this project are not required, since it will be conducted in collaboration with the EthoCebus research team, who are approved for field research by the Brazilian government. The paperwork for my tourist visa to Brazil will be submitted in March 2009.

### 15. Transcript

Transcript attached.