

EARTHWATCH INSTITUTE FIELD REPORT 2004

Project Title: Macaws of the Peruvian Amazon

Principal Investigator: Donald Brightsmith

Position/Affiliations: Research Associate, Duke University Department of Biology

Research Site: Tambopata Research Center, Tambopata National Reserve, Madre de Dios, Peru (13° 07.6' S, 69° 36.9' W)

Local Management Status of the Research Site: Tambopata National Reserve

Primary Species being Studied: *Ara chloroptera*, *A. macao*, *A. ararauna*, *Amazona farinosa* and other members of the family Psittacidae

Key Research Objectives:

- Document reproductive ecology of *A. macao*
- Document the plant species consumed by macaws and parrots
- Document the seasonal fluctuations in macaw and parrot food availability
- Monitor seasonal fluctuations in abundance and movement patterns of macaws and parrot in SE Peru
- Monitor parrot and macaw clay lick use at Tambopata Research Center
- Using nutritional and toxicity analysis of foods and soils, determine why parrots eat soil in SE Peru
- Examine correlations among food availability, reproduction, clay lick use and movement patterns and look for causal links among these variables.

SECTION I: RESEARCH

Data Collection and Results:

Clay lick

From Feb 2004 to May 2005 we observed the clay lick at TRC for 416 early mornings and 168 full days (2,848 hours total). During these observations the number of birds on the lick and the weather were recorded every 5 minutes. The amount of time on the clay lick and clay consumed was tracked for 237 birds using video analysis to determine the behavior of small macaws and parrots on the clay lick in the early morning.

Nests

Earthwatch volunteers conducted 46 nest observations at a total of 8 different active macaw nests for a total of 537 hours. From October 2004 through April 2005 climbers checked a total of 33 potential Scarlet and Red-and-green Macaw nests at least once a week for eggs and chicks in order to monitor nesting success.

Diet and phenology

We checked 1700 trees for flowers, fruits and buds once a month from May 2004 – May 2005 to determine the phenological patterns and the seasonal changes in food abundance for macaws. We discovered macaws and parrots eating on a total of 192 occasions since Jan 2004. Since 2000 we have found macaws and parrots eating approximately 106 species of plants of which 40 have been identified to genus 40 and species 66. Others remain to be identified. We collected 56 food items consumed by macaws and 60 samples of food from the crops of young Scarlet Macaws for use in nutritional and toxicity analyzes.

Telemetry data

We monitored radio tagged Mealy Parrots (N = 5) and Scarlet Macaws (N = 1) on 101 days between 8 Jan and 13 May 2004. This work is financed in part by the Moore Foundation.

Census data

We conducted 815 parrot censuses from Jan 04 – Feb 05. During these censuses, we recorded all the parrots seen or heard over a 10-minute period.

Disease work

We collected blood and fecal samples from 33 individuals in order to screen them for Avian Herpes Virus, parasites, and genetic heterozygosity and relatedness.

Progress

In the past year I have made great progress towards accomplishing a number of important research goals. One of my major research goals this last year was to determine what is driving the seasonal patterns of clay lick use that I have been documenting since 2000. The information on the food availability, parrot censuses, and parrot breeding have provided the critical blocks of information needed to start making sense of how the annual life of macaws and parrots are structured (see the end of the data results summary for more on this). The first round of research publications from this work that came out in the last year have also helped me form new research collaborations that promise to bring a great deal more advances in the coming year. Preliminary analyses of the effects of ecotourism on macaws and parrots on the lick still suggest that there is no large negative impact of having people observing the birds as they visit the lick. The video data have revealed major differences in behavior among bird species at the clay lick which has provided important clues about why different species use the lick in different ways.

Data from six years of nest monitoring have shown that natural nests, PVC nest boxes and wooden nest boxes do not differ significantly in their success rates. This finding was not suspected, but confirms that these nest boxes are a useful tool for managing macaw populations. These combined data sets show that only 22% of the second hatched macaw chicks die of starvation, a number much lower than we had suspected. All of these findings bring us much closer to our objective of documenting, in detail, the management techniques useful in aiding the recovery of macaw populations. The nest

observations have documented the effects of weather and will provide the information needed to help understand the proximal cues that lead to starvation of chicks in the nest and help us focus efforts on how to help save younger macaw chicks threatened by starvation. In reality we have been making small strides forward on all fronts and the project is growing and expanding. It has been a very successful year.

Summary of Results

Clay lick

Clay lick observations show that all species of macaws and parrots have significant seasonal variations in lick use. Most birds' lick use peaks during the breeding season. Preliminary data show that the birds feed clay to their young, which may help explain this trend. However many non-breeding birds also use the lick so the picture is obviously more complex than just the need to feed clay to the chicks.

Detailed analysis of clay lick data have shown that size and sociality of parrot species influences the way that the birds use the clay lick. On average, smaller species (small parrots and parakeets) are more likely to use the sheltered section on the southern end of the lick while the larger parrots and macaws tend to use the larger more open section of the lick further to the north. The parakeets that normally travel in larger social groups appear to be more flexible in the time which they use the clay lick than the large parrots and small macaws that arrive at the lick in pairs or small groups. Large macaws are also flexible in their lick use timing, using the lick at all times of day. The reasons for this are unknown, but may relate to the fact that these birds, even in areas without clay licks, spend a great deal of time resting socializing in groups. Many of the behaviors, spatial patterns and temporal patterns observed at the clay lick appear to be designed to reduce the risk of predation from raptors.

Nests

Since 1999 we have monitored the survival of macaws in 127 active macaw nests including natural nests in trees, nest boxes made from PVC water pipes, and nest boxes made from wood. On average 0.6 chicks fledged per nest counting only nests where eggs were laid. Fledging rates were 0.56 chicks per nest for natural nests, 0.65 for PVC nests, and 0.78 for wooden nests (these values do not differ significantly, Chi-square test, $X^2 = 1.00$, $df = 2$, $p = 0.6$). The number of chicks that hatch per nest range from 1 to 4. On average, 22% of all second chicks starve to death ($N = 23$) while 100% of third and fourth chicks starve ($N = 10$). Reasons for this starvation are not known, but it is suspected that they starve because the larger chicks beg more energetically and dominate the food deliveries from the parent.

Nest observations

Nest observations show that as the nesting season progresses, the percentage of the time the birds spend away from the nest increases sharply. During incubation and brooding of chicks < 7 days old, there is at least 1 adult in the nest 97% of the time. When chicks are 7 days to 6 weeks old, still too young to thermoregulate, at least one adult is in the nest 82% of the time. When chicks are able to thermoregulate, (42 days to 67 days), there is at least one adult in the nest only 46% of the time. As the chicks are preparing to fledge (> 67 days) there are adults in the nest only 27% of the time. Rain has a great effect on the movement patterns of the adult birds. Without rain adults enter

and leave the nest at a rate of 1.69 times per hour while during rain this rate drops to 0.36 times per hour.

Telemetry data

Radio tagged Mealy Parrots (N = 5) were detected on 71 of 101 mornings from 8 January to 14 May 2005. On average, 1.4 MEPA arrived per morning. This was highest in January (2.5 birds per morning and dropped steadily to a low of 0.6 in April and May). This pattern is mirrored by census data and clay lick data. Individuals were not detected for as many as 30 days at a time. The number of days on which birds were detected was highly variable ranging from 19 to 46 (19% to 46%).

Diet

Of the approximately 900 tree species in Madre de Dios, we have found over 100 are eaten by macaws and parrots. The birds eat seeds (44%), whole fruits (29%), flowers (14%), fruit pulp (10%), bark (2%) and leaves (2%, N = 374 foraging observations). The birds eat both ripe (60%) and unripe (40%) seeds and fruits. Analyses of the Scarlet Macaw crop samples collected in Jan 2004 document for the first time the natural levels of Phosphorus, Potassium, Sulphur, Sodium, Calcium, Magnesium, Copper, Zinc, Maganese, Iron, and Boron. The level of these minerals are much higher in the chick crop samples than in the clay lick soils eaten by the birds for all the variables except for sodium. The sodium levels in the clay lick soil are about 4.5 times higher than in the chick crop samples. This suggests that, among the nutrients analyzed, the only one in the soils that should be attracting the birds is Sodium.

Phenology

The data from 11 months of data on the flowering and fruiting of trees at TRC show that the percent of trees with flower buds, flowers, unripe fruits, or ripe fruits (all potential parrot foods) ranges from a low of 7% in March – May to a high of 17% in November and December.

Macaw and parrot censuses in the forest

The preliminary analyses of the parrot and macaw censuses show that there are large seasonal changes in parrot abundance that are repeated among years. The seasonal low in parrot abundance is during March – June. During this same time period our research has found a number of other important trends:

1. The number of birds at the clay lick is at its lowest
2. The number of breeding parrot species is at its lowest
3. The amount of potential food for macaws and parrots is at its lowest

While there is still much analysis to be done there may be a causal link among these factors. Food supply probably drives the timing of parrot breeding. During the non-breeding season when food supply is low, the birds disperse away from the area around TRC may wander through the landscape tracking available food supplies. During the non-breeding season, the drive to use clay licks is also lower. If this is the case, it could explain why census numbers, clay lick use, breeding parrots and potential food are all lowest from March – June.

Significance/Benefits of Research:

- Local (in the area of the research site)
 - The project contributes directly to the success of TRC and Posada Amazonas (the lodges of the Peruvian company Rainforest Expeditions). These lodges in turn purchase supplies and employ staff from the local communities. The lodge Posada Amazonas is also half owned by the Native Community of Infierno, so all community members benefit from the success of the lodge. The macaw research also employs and trains a small number of local people each year. The macaw project staff also help teach the guide course for the Native Community of Infierno and Rainforest Expeditions .
 - I have close ties with the directors of the Tambopata National Reserve and Bahuaja Sonene National Park where I work. The results from the research help me advise the park directors how to better manage the protected areas.

- National
 - The project works closely with a wide range of Peruvian collaborators. We work with and train veterinarians, biologists, foresters from all over the country on how to conduct field research. We also sponsor Peruvian students and young professionals interested in working on theses and independent projects within the larger macaw project.
 - The information from the project is also shared through talks, reports, and publications with young students in Lima and INRENA.

- International
 - We have worked with and trained dozens of young volunteer scientists from over 16 countries since the project began, many of whom have gone on to pursue higher degrees. One of these young scientists has designed and conducted a successful parrot research and conservation project in Costa Rica.
 - In addition, about 1,500 international tourists per year visit Tambopata Research Center and nearly all receive a talk about the research we are doing here and the importance of conservation.
 - The information from the project is shared through scientific publications, talks, and magazine articles.
 - Through direct connections I have advised parrot research and conservation efforts in Puerto Rico, Brazil, Costa Rica, Mexico, Guatemala, Trinidad, and Ecuador. Due to my work in Tambopata I have been invited to become a member of the advisory board for Parrots International, a conservation NGO and for a macaw reintroduction project in Brazil.

Contributions to Sustainability

This research helps protect an important and potentially exploitable natural resource: parrots and macaws. The work also provides direct and indirect economic benefits and education to local communities, national businessmen, international scientists and international tourists in a way that apparently does not damage the resource for the long term. Details of how the project helps these groups is discussed under the “significance and benefits of the research” section above.

Dissemination of Results:

- *Scientific papers*
 - Brightsmith, D. J. 2004a. Effects of weather on avian geophagy in Tambopata, Peru. *Wilson Bulletin* 116:134 -145.
 - Brightsmith, D. J. 2004b. Nest sites of termitarium nesting birds in SE Peru. *Neotropical Ornithology* 15:319-330.
 - Brightsmith, D. J. In press. Parrot nesting in SE Peru: seasonal patterns and keystone trees. *Wilson Bulletin*.
 - Brightsmith, D. J., and R. Aramburú. 2004. Avian geophagy and soil characteristics in southeastern Peru. *Biotropica* 36:534-543.
 - Brightsmith, D. J., and A. Bravo. In Press. Ecology and management of nesting Blue-and-yellow Macaws (*Ara ararauna*) in *Mauritia* palm swamps. *Biodiversity and Conservation*.
 - Brightsmith, D. J., and A. Figari. In prep. Seasonal patterns of avian geophagy in Tambopata, Peru.
 - Brightsmith, D. J., A. Figari, and D. Matsufuji. 2004. Ecología Reproductiva y uso de Colpas de Guacamayos en Madre de Dios: Informe Anual a INRENA. Duke University, Durham, NC.
 - Brightsmith, D. J., J. Hilburn, A. Del Campo, J. Boyd, M. Frisius, R. Frisius, D. Janik, and F. Guillén. 2005. The use of hand-raised Psittacines for reintroduction: a case study of scarlet macaws (*Ara macao*) in Peru and Costa Rica. *Biological Conservation* 121:465 - 472.
 - Brightsmith, D. J., and E. Villalobos. In prep. Parrot flocking and predation: behavioral strategies at an avian geophagy site in Peru.
- *Management plans and reports*
 - By Mercedes Flores (D. J. Brightsmith advisor): Use patterns of palm swamps by psittacids and tourists, for INRENA (Peruvian agency in charge of natural resource management and conservation).
- *Presentations*
 - Tambopata Research Center: guests, Earthwatch volunteers, and researchers, Nov 2003 – Feb 2004, Nov 2004 to Feb 2005, about 500 people total
 - Rainforest Expeditions' Guide Training course: students from Lima, Cusco, and local communities, 2 talks, Feb 2004, Feb 2005, 80 students total
 - Native Community of Infierno Guide Training Course: students and faculty, Nov 2003, January 2004, 20 people total
 - Annual meeting of the Society of Neotropical Ornithology, Chile, 2 talks, October 2003, 100 people total
 - Rio Los Amigos Research Center, Peru (CICRA): researchers and staff, Dec 2003
 - Masters in Ecotourism, Universidad Nacional Agraria La Molina: students and faculty, January 2004 and 2005, 40 people total
 - State University of New York at Stony Brook, Department of Evolution and Ecology: faculty and students, March 2004, 50 people
 - Raleigh Durham Caged Bird Society: monthly meeting, April 2004, April 2005, 75 people total

- Organization for Tropical Studies, Research Experience for Faculty program in Costa Rica: faculty and participants, July 2004, 20 people
 - Association for Tropical Biology and Conservation: annual meeting, Miami, July 2004, 40 people
 - American Federation of Aviculture: annual meeting, August 2004, 75 people
 - Universidad Peruano Cayetano de Heredia, School of Veterinary Medicine: Faculty and students, March 2005, 100 people
 - Texas A&M, School of Veterinary Medicine: faculty and students, April 2005
 - Puerto Rican Parrot Project: researchers and staff, April 2005, 10 people
 - Macaws of Iguazu Reintroduction Project: advisory board members, May 2005, 13 people
 - Parrots International Annual Symposium: May 2005, 70 people
 - EarthWatch Europe: EarthWatch lecture series, June 2005, 500 people
 - Annual meeting of the Association for Conservation Biology, July 2005
 - Duke University, Program in Ecology: faculty and students, September 2005
 - Northern Illinois Parrot Society, Flying in to Knowledge Symposium, September 2005
- *Popular articles or films*
 - The real dirt on parrot clay licks, Bird Talk Magazine, October 2003