

SHORT ARTICLES

ENVIRONMENTAL EDUCATION: A TEACHING TOOL FOR THE CONSERVATION OF PYGMY MARMOSETS (*CEBUELLA PYGMAEA*) IN THE ECUADORIAN AMAZON

Stella de la Torre
Pablo Yépez

Introduction

The pygmy marmoset (*Cebuella pygmaea*) is the smallest monkey in the world. It inhabits the upper Amazon basin of Ecuador, Colombia, Peru, Bolivia and Brazil (Soini, 1988). In Ecuador, we have records of the species from about 220 m to 500 m above sea level, in habitats along rivers and lakes in the eastern lowlands (de la Torre, 2000). The habitat specialization of pygmy marmosets makes them particularly vulnerable to anthropogenic impacts, since human settlements and activities are centered on riparian habitats (Meggers, 1989). Thus, despite the relatively wide distribution of pygmy marmosets in eastern Ecuador, we have increasing evidence that this species could be severely disturbed by human activities, altering its social behavior and possibly reducing its population size (de la Torre *et al.*, 2000).

Pygmy marmosets are not included in any of the IUCN categories in the Red Data Book of Ecuadorian mammals; they are listed only in the CITES Appendix II (Tirira, 2001). However, based on the evidence we have gathered during almost seven years of research, we suggest that the status of this species needs to be revised. Indeed, the populations we have studied in northeastern Ecuador have been severely affected by live capture, noise pollution and habitat destruction (de la Torre *et al.*, 2000; Yépez *et al.*, 2003). These factors are related to the development of the petroleum industry, the continuous increase of human populations due to high reproductive and migration rates, and the cultural loss which native communities are experiencing due to their rapid insertion into Western cultures (Ministerio del Ambiente *et al.*, 2001). All these factors have altered the equilibrium of natural ecosystems and are negatively affecting the populations of pygmy marmosets.

Live capture of pygmy marmosets, in particular, is a common practice of children and adults of many indigenous communities. They are also eaten in some areas, or killed for target practice in others. We believe that these problems could be mitigated with a program of environmental education. We began such a program this year, directed to the children of the communities that live close to some of the pygmy marmoset populations we studied. The program was based on a didactic game through which children learned about the ecology, behavior and conservation of these small primates.

Planning Stage

Our study of five different populations of pygmy marmosets in northeastern Ecuador, along with information from other studies elsewhere, allowed us to summarize several aspects of the ecology and behavior of this primate species, such as its habitat preference, feeding behavior, group composition and parental care. We then recreated this information in a wooden poster of 120 x 90 cm, in which we drew a riparian forest, a feeding tree with real holes in the trunk, and the profiles of six animals of different ages and sex (one reproductive pair, one subadult, one juvenile and two dependent infants), representing a typical group of this species. The profiles of these animals were the basis of a puzzle of six wooden figures of the six different animals to be attached to the corresponding profiles by the children during the game (Fig. 1). The wooden poster can be folded up and is easily carried. Large sheets of paper, thin cardboard, color pencils, scissors, glue and stickers allowed children to recreate, in their own drawings, the life of pygmy marmosets based on the poster games.

Process Stage

We carried out this program in two indigenous communities of Ecuadorian Amazonia. The first was the Secoya community of Bellavista on the southern bank of the Río Aguarico (00°16'42"S, 76°25'30"W). The school of this community had 15 children. The second was the Quichua



Credit: Pablo Yépez

Figure 1. Wooden poster of pygmy marmosets used for teaching games in the schools of the Secoya community of Bellavista (on the southern bank of the Río Aguarico), and the Quichua community of Añango (on the southern bank of the Río Napo), Ecuador.

community of Añango on the southern bank of the Río Napo (00°29'29"S, 76°24'59"W), with 20 children in its school. The ages of the children ranged from 4 to 14 years old. Our audiences also included 2-5 young adults (ages 18-20) and 1-2 older adults (more than 30 years old). We selected these communities for our pilot work because we are studying pygmy marmoset groups living close to these settlements, and we have evidence that they are continuously affected by live capture and target practice.

In our presentation we first explained to the children the purpose of our study of pygmy marmosets. We showed children some of the equipment we use, such as binoculars and tape recorders, and showed them how they work. We then began a dialogue to determine what children knew about pygmy marmosets. We had them answer questions about where pygmy marmosets live, what they eat, how many infants are born, how females care for the infants, and how humans could affect them.

After this introduction we began the games with the poster. We first asked the children to solve the marmoset puzzle, pasting each independently moving animal to the corresponding profile in the poster (the two dependent infants were not included in this first game). Different children pasted each of the four marmoset figures while we talked about the riparian habitat in which they live. We then told them about the gum-feeding behavior of pygmy marmosets, and let all the children experience how it might feel by licking a vitamin gel that we poured into the holes of the "gum tree" on the poster. Children later mimicked insect-feeding by finding and eating candies hidden in the classroom.

Finally, we talked about the social organization of these primates: the size and composition of groups, the reproductive pattern and some conspicuous infant-caregiver behaviors (e.g., infant-carrying). We explained to them how important it is for the marmoset infants to be carried and attended by other group members, similar to the way that human infants need their family to survive. The children then participated in a new game with the poster, in which we told them that the two infants of the group were lost and that they were crying for their family. One child participated in the game at a time; first we blindfolded the child, and then simulated infant crying to guide the blindfolded child to the figures of the two infants. Once the child got one of the infants, he or she had to paste it on the back of a caregiver while still blindfolded.

Once this second game was over, children were divided into small groups. Each group was provided with paper, thin cardboard, scissors, color pencils and glue, and began to create their own version of a family group of pygmy marmosets in the forest, based on what they learned from the poster.

Our presentation ended with an explanation of the importance of preserving primates in general and pygmy mar-

mosets in particular, and about the need to maintain and manage wisely the natural resources of the tropical rainforest. We asked the children to commit to conserve primates and their environments. To reinforce this commitment we used happy-face stickers (to make them remember the benefits of conserving the monkeys and the environment) and sad-face stickers (to remember the negative impacts of disturbing monkeys and the environment) that we stuck on opposite sides of each child's face.

Product Stage

We carried out this environmental education program between June and August 2003, and thus the long-term results are still being analyzed. We have anecdotal evidence of the positive effects of the program on the attitude of children of all ages in relation to our work and to pygmy marmosets. After our presentations, children began to accompany us on our daily observations, helping us to carry the equipment and to follow and observe the marmosets. They also frequently told us that they will not disturb monkeys again and that they wanted us to continue to give our presentations in their schools.

We believe that the interactive games we designed with the wooden poster are key to maintaining the attention of children. The interest the children of all ages showed in the poster and their willingness to learn more about pygmy marmosets was remarkable. During our presentations all the children and the accompanying adults were relaxed and frequently laughing while participating in each of the games.

Conclusions

These are our first experiences in this community-based program of environmental education. We are aware of the need to continue in the communities where we have already worked, and to expand it to other communities in the Ecuadorian Amazon. We are currently working on the design of a more systematic evaluation protocol that will allow us to better analyze the results of the program. Although several environmental education programs have been carried out in Ecuador, there is still much to do in order to improve the environmental awareness of the people in our country. We hope that our work will help to increase the environmental awareness of Amazonian inhabitants, and to preserve pygmy marmosets as well as other primate species and their habitats.

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Stella de la Torre, Universidad San Francisco de Quito, Av. Interocéánica y Jardines del Este, Cumbayá, Quito, Ecuador, e-mail: <stella@mail.usfq.edu.ec>, and Pablo Yépez, Fundación Vihoma, José Tobar 884 e Hidalgo, Quito, Ecuador, e-mail: <huati@yahoo.com>.

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THE DISCOVERY OF A NEW POPULATION OF BLACK LION TAMARINS (*LEONTOPITHECUS CHRYSOPYGUS*) IN THE SERRA DE PARANAPIACABA, SÃO PAULO, BRAZIL

Fabio Röhe
André Pinassi Antunes
Cristina Farah de Tófoli

A group of black lion tamarins (*Leontopithecus chrysopygus*) was sighted on 19 December, 2002, at 4:30 pm, at the Fazenda João XXIII (23°53'09"-23°56'29"S, 47°42'30"-47°40'08"W), in the municipality of Pilar do Sul, state of São Paulo, Brazil. The farm belongs to Eucatex S/A and is located in the Serra de Paranapiacaba, near the Carlos Botelho and Intervales State Parks. The farm is a mosaic of *Eucalyptus* plantations (1307 ha) and patches of Atlantic

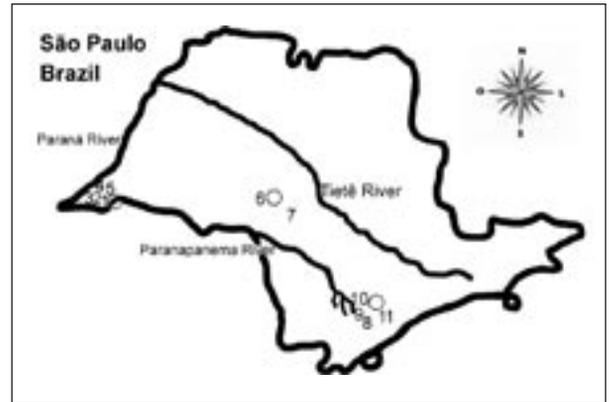


Figure 1. Recorded wild populations of black lion tamarins (*Leontopithecus chrysopygus*). Numbers with circles indicate protected areas.

forest, comprising small forest fragments and gallery forest (440 ha) and a large fragment of 611 ha.

The group was composed of at least five individuals. They were calling intensely during the observation period at the same time as some bare-throated bellbirds (*Procnias nudicollis*). It is possible that the bellbirds were excited by the presence of the lion tamarins. Foraging associations of black lion tamarins and insectivorous birds have been described in the literature by Passos (1997), who mentioned that the birds were sometimes alarmed by the primates. We were able to observe the lion tamarins at heights of 5-8 m for about 10 minutes, after which they became silent and disappeared. No pictures or audio recordings of their vocalizations were taken.

Until recently, black lion tamarins were known to occur in only three protected areas in São Paulo (Morro do Diabo State Park, Caetetus Ecological Station and Angatuba Ecological Station), and in six other forest fragments located in the western and central regions of the state of São Paulo (see Coimbra-Filho, 1970; Coimbra-Filho, 1976; Mamede-Costa and Gobbi, 1998; Passos, 1994; Valladares-Pádua and Cullen Jr., 1994; Valladares-Pádua *et al.*, 2002). More recently, two new sub-populations were found in forest fragments in the eastern part of the state in the municipality of Buri (Valladares-Pádua *et al.*, 2002) (Fig. 1).

This is the eleventh remaining natural population recorded for this species, and the easternmost record of the distribution of *L. chrysopygus* in recent times. Several specimens were captured by J. Natterer in 1819 and 1822 in the municipalities of Cotia and Ipanema, and by E. Garbe in 1902 at Vitoriana; in addition, the pelt of one specimen from Bauru was given to the São Paulo Zoology Museum (MZSP) by O. Humel in 1905 (Vieira, 1944; Coimbra-Filho, 1976). However, none are known to survive in these regions today. Because the new Serra de Paranapiacaba population is in a relatively large forest, it may represent a new hope for the survival of this species. Surveys and censuses need to be carried out in this forest and others in the region, to better determine more exactly the numbers surviving there.